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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

BE READY FOR WAR.*

By BEEKMAN WINTHROP, Assistant Secretary of the Navy.

It is with some hesitation that I agreed this year to deliver the opening address to the War College, as I realized that any discussion of the work of a war college is in large part technical, and can best be discussed by technical experts. On the other hand, it is of advantage to men of any profession at times to have the general scope of their work, as distinguished from the technical details, discussed from an outsider's point of view—from the point of view of a layman. Partly for this reason, but mainly because I desired to express the interest the Navy Department takes in this college, I decided to accept the invitation of your President tendered a few weeks ago. It is most desirable that the work of the War College should be emphasized. Your work is not spectacular, it necessarily does not attract or hold the attention like gun work at battle practice, or the maneuvers of an extensive fleet, or even like the well drilled evolutions of a trained body of Jackies. While improvements in firing, or developments in the design of ships can be easily appreciated even by a mind not trained on technical lines, the necessity for a serious, hard course in the art of war is not so self-evident to the ordinary civilian. To the average layman the desideratum is fully obtained by providing a well disciplined force and the highest development of

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material. Such, of course, is not the case. The training of the force and the development of material to their highest point of efficiency is of the utmost importance, but an efficient administrator with high technical knowledge of ordnance, engineering and general naval mechanics, with a thoroughly disciplined and powerful force, might well fail when brought into conflict with a more skilled strategist, even though armed with less numerous or efficient weapons. History is full of such cases. In the battle of Salamis, Themistocles, with only 310 sail, defeated the fleet of the Persian King Xerxes, composed of some 2000 ships. In 1630 Admiral Tromp, of the Dutch Navy, signally defeated a Spanish fleet, under Admiral Oquendo, of more than double the number of vessels. Consider also Nelson's victories of the Nile and Trafalgar, won over superior numbers by more skillful strategy.

Preparedness for war does not end with a sufficient number of adequate ships and a ready supply of well-disciplined men. Just as important as these two branches is the preparedness of the directing officers to meet any strategic situation or emergency. The quality of leadership is all important. It would indeed be a short-sighted and extravagant policy to build expensive fleets unless men were provided fully trained to know how best to use and dispose of them. Initiative, self-reliance, resolution and ability to forestall the enemy's moves are qualities that must be developed to produce an efficient leader.

Just as in every profession practical experience is the best training, so the best training for war is war. In the past such practical training was not infrequent. Before the present high development in the munitions and art of war, when wars were not so serious in their results and did not cause such a terrific financial drain on a country, whether victorious or defeated, they were of more frequent occurrence and of longer duration. Until comparatively recently, indeed, countries were so unprepared for hostilities that the first months, or even years, after war was declared were spent in preparation, assembling supplies, recruiting and training, before decisive actions occurred. Under such circumstances leaders developed and trained during the early stages of the conflict were available long before the termination of hostilities. Such was the case with men like Sheridan, and even Grant, for although the latter fought in the Mexican War, he was practically unknown prior to the capture of Fort Donelson

in 1862. Moreover, in former times officers who had gained experience in one or more prior wars were generally available to apply that experience in the pending hostilities. Conditions have changed. In these days events move rapidly. No longer is there a long delay between the declaration of war and the outbreak of hostilities. The first blow is all important. It may well decide the war, leaving the defeated nation in such a weakened condition that even with great financial resources, it has no time to rehabilitate and prepare itself for another conflict before the final blow is struck. In these days we have not the time to train our leaders by the sanguinary process of actual war, even were we not prohibited by the enormous loss of life and property that such a course would entail. Nor can we count on leaders in the future who have had experience in past wars. In this country since the Revolution an average of twenty-seven years have elapsed between wars of any magnitude in which we have been engaged. Between the Revolution and the war of 1812, twenty-nine years elapsed, then ensued thirty-four years of peace until the Mexican War. Thirteen years later we were engaged in the greatest struggle of our existence, the Civil War; and thirty-three years after its close the Spanish War began.

In the future I believe and trust that wars between leading nations will be of less frequent occurrence, but even taking that average of nearly thirty years, you will see that any officer who held sufficient rank to take a leading part in one war would in all probability have passed the active stage of his life before the next contest began. The responsibilities of present-day wars is so great that only comparatively young or middle-aged men can long endure the physical and mental strains. The average age of Farragut, Porter and Foote in the Civil War was fifty-two years, while the average age of probably the three most distinguished generals on both sides—Grant, Sherman and Sheridan; Lee, Jackson and Johnston—was but forty-four years. At the battle of Tsushima, Togo was fifty-eight and Uriu but forty-five. It will be seen, therefore, that few of these men could have gained practical experience in previous wars, if they occurred only at intervals of thirty years.

It being impracticable, therefore, to rely on actual experience in war to train our officers, what is the best method to pursue and what in general must be the aim of such training? Broadly

speaking, an officer must be well versed in the handling and administration of ships and in the technical details of their equipment. This technical training is supplied at Annapolis and in the post graduate special courses in engineering, ordnance, naval architecture, etc., and the practical application of such training or experience is furnished in the periodic cruises. The necessary administrative training, including the handling and directing of men, is afforded by the every-day duties of an officer from the moment he receives his commission as Ensign.

But the broader knowledge of the art of war—an equally important part of every officer's training—must be derived from other courses. It must come from a careful study of past wars, taking advantage of the experience of others, and a detailed consideration of all probable or possible contingencies in wars to come. Only by a careful preparation on these lines can an officer adequately supplement the technical and administrative training he obtains elsewhere. No line officer is fully qualified for command unless and until he has made such a study, and this War College was established and is maintained to afford suitable opportunity for such study. I fear that at times the importance of the study of the art of war is lost sight of. I know it is so among civilians, and I have occasionally noticed the same tendency among certain officers. Naval officers are measured mainly by their skill in handling ships, or their efficiency in ordnance, machinery or other parts of the fighting machine. This is necessarily so, as the opportunity to so gauge their qualifications comes daily. Owing to the infrequency of wars there is but little opportunity outside this course to test the average officer's ability on the broader lines, as a strategist or a war leader. Gunnery, seamanship, navigation, engineering, etc., are all merely incidents in the full development of a naval officer. Those details must be mastered, but unless the leaders are also skilled in the art of war the labor expended is in large part wasted. An accomplished fleet or army administrator, or an expert in war equipment would not necessarily make a good leader in time of war. The most striking example of this in recent years is, of course, McClellan, an able and efficient organizer but a failure as a battle leader. Grant is reported to have said of McClellan, "The test applied to him would be terrible to any man, being made a major-general at the beginning of the war. McClellan was a young man when

this devolved upon him, and if he did not succeed it was because the conditions of success were so trying. If McClellan had gone into the war as Sherman, Thomas or Meade—had fought his way along and up—I have no reason to suppose that he would not have won as high distinction as any of us." But unfortunately for McClellan he did not have this opportunity, nor was his mind so trained in the art of war, prior to the outbreak of hostilities, to enable him to take proper advantage of his magnificent force.

A well-equipped leader should be prepared beforehand to act upon every conceivable contingency. As Mahan says, "Presence of mind consists largely in preparation of mind." To be suddenly confronted with an unexpected emergency is almost certain to create confusion and irresolution, unless by careful training an ability to meet just such unforeseen contingencies has been developed. The development of this characteristic should be one of the aims of a war college course. Indeed, it is one of the natural results of a study of the art of war. Young officers upon taking the deck are often advised by their superior officers to make up their minds how they would act in various contingencies, for example, should a man fall overboard, should land be sighted or should a squall suddenly arise. This is excellent advice, but how much more important is it for all officers eligible to command to work out similar questions on broad lines of strategy. The consideration and determination of what one should do in various contingencies is certain to strengthen resolution and decision—qualities which are essential in leadership in war. Thus the main purpose of this War College is to consider and determine what should be the course of action in all conceivable situations, preparing officers not only so that they will know how promptly to act should one of such or similar contingencies arise, but developing by such a course of training the essential quanties of leadership. Next to actual war a well planned war college course affords best opportunity for such development thus far devised.

On reading the reports of the Japanese officers during the recent Japanese-Russian War, one cannot fail to be struck by the frequent reference to "Evolutions or movements as prearranged." The reports mention occurrences at the commencement of any action and then conclude, "and thenceforth the movement proceeded as prearranged," showing how carefully every contin-

gency had been considered, every detail outlined. At the beginning of the war the Japanese vessels of all kinds numbered 191, those of the Russians 453. The result was due in large part to this "prearrangement" on the part of the Japanese, and the lack of antecedent preparation on the part of her adversary.

Our Civil War was another glaring example of unpreparedness, in the early days of the conflict, not only in war material but in any well conceived idea of operation. The recently published diary of Gideon Welles is most interesting on this point. Conditions in 1861 were chaotic. No one had any preconceived idea of what should be done. The Secretary of State ordered naval officers to the command of ships and directed their movements in certain cases without the knowledge of the Navy Department. The President himself, at the instance of the Cabinet advisers, would sign or revolve orders to naval officers without informing Secretary Welles and it was only after bitter experience of the folly of such haphazard policy did order prevail. Much of the confusion was due to faulty administration, but in the main it was caused by the failure to prepare any systematic or well digested outline of operation prior to the outbreak of hostilities. No one knew what to do, and movements were suggested, begun and revoked with a frequency that would have been fatal to our cause had we not been faced by an adversary as unprepared as we. If, at the fall of Ft. Sumter, the United States had possessed a strong navy, and an intelligently considered plan of action, the Civil War would have been ended in a few months. It was lack of preparation, both in munitions of war and in any preconceived line of attack, that allowed the war to last for four years.

I realize that these views are probably an old story to most of you, but I desired to emphasize the fact that we in the Department thoroughly appreciate the value of your work. The Department is doing its utmost in the face of most discouraging ignorance and lack of appreciation of the vital necessity of a strong navy to our country, to provide you with adequate tools with which to work. I hope and believe that in the end intelligence will prevail over ignorance, foresight over blind negligence. But, however that may be, it depends and always will depend upon the officers themselves to so prepare themselves to make the best possible use of the tools given them when the necessity arises and the country calls upon them for aid.

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THE RELATIONS OF THE WAR COLLEGE TO THE NAVY DEPARTMENT.

By Captain William L. Rodgers, U. S. Navy.

In order to see just what part the Naval War College has to play in the organization of the Navy Department, it will be necessary to trace the course of development in the Department's organization since its establishment, and to note how far the Department has been able to respond to the demands upon it in each period of emergency and stress caused by war. While thus engaged, it will be advantageous to turn aside occasionally to note how other nations adapt their organizations to accomplish similar purposes. We shall thus appreciate what was lacking in our navy's early development and why we need a War College.

To begin with, the navy was started by the law of 1794 as a branch of the War Department during the Presidency of General Washington, with General Knox as Secretary of War. The occasion which originated the law was the annoyance caused to American shipping in the Mediterranean by the Barbary pirates; so the navy was begun to attain a definite political objective. As the President and his Secretary of War were both military men of ability, they set about the business of building a navy in the proper way. They assembled several of the ablest members of the Continental Navy in Philadelphia, explained to them the object for which the fleet was needed, and directed them to decide upon the types of ship required for the purpose. After full deliberation upon the military characteristics required by the special situation of the United States, six frigates were laid down in various parts of the country. According to present-day ideas, the form of organization adopted was very much decentralized. The six distinguished officers of the old Continental Navy who were selected to be the nucleus of the new Federal Navy, were made superintendents of the new ship building yards, and together they placed the contracts

for timber and other large supplies through the Treasury. For the rest, the War Department organized each establishment under the superintendent with a navy agent, a constructor, and a clerk of the yard.

The navy agent was the contract officer for the smaller supplies, the purchase officer and paymaster and the employer of labor. His disbursements required the counter signature of the superintendent. The agent received 2½ per cent on his disbursements; and the office existed until 1865, by which time the agents were political appointees, and were more or less corrupt. They were replaced by navy paymasters in that year. The clerk of the yard was the general storekeeper accountable for all material and the bookkeeping of time and wages. The constructor was the ship builder who worked from the plans approved by the Department which had been drawn up by the celebrated ship builder Joshua Humphreys to conform to the military views of the group of officers who were afterwards appointed superintendents. The constructor was responsible for the efficiency of material and workmanship; the superintendent was charged directly with the rigging and equipment of the ship, and was the inspector and controller of the other departments of the establishment. Later on, as the ships approached completion, Congress passed additional laws, one authorizing the recruitment of a naval force, another establishing rates of pay, and another establishing discipline (Articles for the Government of the Navy). Then, in 1798, as these ships began to go into commission, Congress removed the navy from the charge of the War Department and established it as a separate executive department. But the administration of the navy continued to be very decentralized, as it could well afford to be under the circumstances. During the brief quasi war with France in the West Indies and the subsequent Tripolitan War in the Mediterranean, the navy was in its formative period, and its operations were led by very able men. The Secretary directed the commanders-in-chief as to the objects of the war, and entrusted to them the control of administrative details necessary to carry on the operations.

But Jefferson who succeeded to the Presidency just about the time of the Tripolitan War had no sympathy with the navy and believed that its mere existence was a menace to the peace of the country. Upon the successful conclusion of the Tripolitan War he laid up most of the frigates and did much to break up the rational

but somewhat inadequate organization of the Department which had been developed by Presidents Washington and Adams. The policy of Jefferson was devoted to obtaining a flotilla of gun boats for defence. These were really of little use at any time owing to their small size.

When the country was forced into war in 1812 the Navy Department was totally unprepared either with adequate fleets or with plans. Fortunately, the few fine frigates begun by Washington were ready and were commanded by the able officers trained by Preble in the Tripolitan War. But it required the strongest remonstrances from Bainbridge and Stewart to prevent the Secretary from making the navy safe by laying it up out of reach of the enemy. Upon the declaration of war, the squadron at New York, commanded by Commodore Rodgers, escaped wholly from the control of the Department and put to sea against the wishes of the Department, whose timid instructions fortunately arrived too late to detain it in port. As Mahan points out in his history, the cruise of this force covered the arrival in port of a great number of merchantmen returning home.* In addition to this cruise the chief work done by the navy was on the Great Lakes in the campaigns of Chauncey, of Perry and of McDonough. We find here as elsewhere evidence of great decentralization in the organization of the Department. The men in charge in each theater of war were vested with authority to disburse money to obtain a naval force, and the manner of accomplishing their task was in their own hands. They cut the timber, contracted for guns, enlisted the crews, and if they called on the Department for aid in any of these matters they got little satisfaction, for the Department was unequal to its task. The Secretary of the Navy in office at the outbreak of war resigned in a few months; for although well meaning and industrious he was unequal to the task of getting efficient work out of an unorganized office. He was succeeded by General William Jones, a very able man, with military, naval and civil experience to draw upon, yet early in the spring of 1813 he confessed to Congress that "the vital error appears to me to consist in loading the chief of the Department with the cognizance of details, and with the execution of duties which divert his attention from the great and effi-

*Had the squadron stayed in New York, the British would have blockaded it there and caught the returning merchantmen too. As it was the British squadron had to keep together, while it chased at random. The case illustrates a proper use of an inferior force.

cient objects of the establishment; or the inevitable alternative is to submit the execution of those duties to subordinate agents." Congress replied by a request addressed to him to formulate a proper organization, which he did at the end of the year. Jones' report explains the difficulty he had in supervising the work of the Navy Department, both in the civil and military branches, sketches the outline of the English system and points out its deficiencies in the management of military features. The report then goes on to suggest a form of organization suitable for the United States in which a Board of Inspectors shall have control of the business of the Department subject to the Secretary, and the report prepares a schedule of duties for the board and the assignment of distinct duties to each member.

Congress adopted a modification of the Secretary's proposal, in which the principal change was that the board as established was to act as a unit, so the members had no individual duties to manage under the general supervision of the board. Thus the consultative feature of the British Admiralty organization which is so strong a power for co-ordination of the effort of its individual members was omitted by Congress. In the phraseology of this act, Congress adopted Jones' idea that the board was to control both the civil and the military branches of the Department work, namely, "Construction and Employment," but from the reports of the committees of the Senate and House it is quite plain that Congress did not grasp the idea that there should be such a thing as an organization in the Department for the management of the military affairs of the navy. This Thirteenth Congress took the view which has always since prevailed in Congress that a Navy Department can be and is efficient if its civil branches are honestly and economically administered. The board had no sooner taken office than under the act it claimed cognizance of the "Employment of Vessels." That is to say, the board thought its duties were military as well as civil in their nature. But Mr. Madison decided that the military branch of the navy should be under the direct control of the Civilian Secretary, leaving the civil branches of the navy to be directly managed by the board of naval officers under the Secretary's supervision. This absurd inversion remained the rule until 1842.

But as the Secretary and his clerk were devoid of technical knowledge they were obliged to turn for advice at every instant to the only professional men at hand, the members of the board. This

very anomalous position of the members of the board was in time a principal cause of its downfall.

The board did most excellent work in the line committed to it. It introduced a considerable degree of system and economy in the navy yards, and framed much needed regulations for the military branch of the navy, which were beyond its statutory powers, although no doubt proper enough after the Secretary and President authorized them.

All these improvements brought the board enemies. Many captains who had been kings afloat before the establishment of the board found the latter advising and supporting the Secretary in restraining them and consequently there was a strong feeling in the service against the board. The navy agents and other civil employees objected equally to supervision and control. As the period of peace lengthened, the navy as a military arm was overlooked. Administrations and Congresses regarded the navy as a means of distributing political patronage.

The commissioners apparently never forgot that the navy was military in its nature, and consequently their action in their own sphere of "supply" and their advice to the Secretary on his exclusive military duties was sound and directed toward military efficiency. The constructors of the navy were civilians who shared the prevalent views of the public and of Congress, that the navy was able to fulfill its purpose in war provided it preserved a bare existence during peace, and these did not like the interposition of the Board of Navy Commissioners, between the chief constructor at Washington and the work at the navy yards, for the advancement of military ideas.

Furthermore, as the members of the board were the principal naval people near the Secretary and were known to advise him, the board got the discredit, frequently undeserved, of every military act of the Secretary which did not commend itself to the service.

Besides the board did not have a proper organization under it for the control and sub-division of separate branches of its executive work and consequently, as a board, it had difficulty in handling the details of such work.

Thus, both for what it did and for what it could not control, the board lost support and received abuse, and in 1842 the act of 1815 was revoked and the civil duties of the board were distributed among five bureaus.

In the report made in 1839 by the Secretary of the Navy, at the request of Congress, upon the subject of this reorganization, Secretary Paulding laid down that: "The duties of the Secretary of the Navy naturally arrange themselves under two distinct heads. The first comprises those connected with the more general and comprehensive interests of the state. Among these may be classed recommendations for increasing and distributing the force to be commissioned, as the exigencies of the case may seem to require and the direction, employment and discipline of all persons belonging to the navy. Under the other head may be arranged everything connected with the construction, equipment and maintenance of the naval force.

"The former requires no special technical or professional knowledge or experience, as resort may at all times be had to the advice of those who possess the requisite qualifications. They may, therefore, properly be left to his superintendence (meaning the Secretary) and direction. Such is not the case with the second class of duties, the adequate performance of which calls for long professional experience and it is believed can be more completely attained under the ministration of competent naval officers."

The Secretary goes on to say that these duties of his second class hitherto performed by the commissioners are naturally susceptible to division under three separate heads, each under a single officer, and classified them as follows:

1st. Ship building.
2d. Dock yards.
3d. Supply.

These views of Mr. Paulding as to the relations of the civil and naval branches of the Navy Department, and as to the advisability of the Secretary's assuming complete and sole charge of the naval and professional side of the Department work without any technical adviser are really remarkable, and it is even more remarkable that no one in Congress seemed to have protested at their absurdity.

Two years later another Secretary, Mr. Upshur, reported that he was overwhelmed with work, and needed more help and better arrangements to deal with it, but he approved the report of his predecessor, Mr. Paulding.

Commodore Charles Stewart, who was a strong opponent of the commissioners, proposed a division of work of the Department under six bureaus, of which the first should be in charge of the

personnel of the navy and the employment of the fleet. Two other bureaus were the same as Secretary Paulding proposed, while the other three divided among them the duties of Mr. Paulding's third bureau. The Congress agreed with Paulding and Upshur that the military side of the navy needed no technical control, but otherwise it adopted Commodore Stewart's plan. The result of the change was that additional machinery was provided for the civil branches of Department work, but military efficiency and military organization was an idea not so much as perceived in that Congress any more than it had been by Mr. Madison and other Congresses and administrations subsequent to him.

The three commissioners of the navy whose office had been terminated, took charge of the first three bureaus and a civilian was put at the head of provisions and clothing and a surgeon at the head of medicine and surgery.

The Secretary remained in charge of recruiting, discipline and the military employment of the fleet. The Department continued under this general system through the Mexican War, which, however, made little tax upon the capabilities of the Department because Mexico had no naval force of importance. But the outbreak of the Civil War threw an immense burden on the Secretary, who was in sole direct charge of the entire personnel and the conduct of the war.

The Navy Department came through the Civil War triumphantly, and since then it has been the custom to say that the bureau system of naval administration stood the test of the Civil War, and therefore is adequate to the needs of the navy to-day. The premise is incomplete and the conclusion is an incorrect one. The bureau system did stand the test of the war, but it did not stand the burden of administration by itself. As soon as the war broke out the Secretary developed a great administrative superstructure which supplemented the work of the bureaus.

In the first place a board of officers was formed, which corresponded more or less to the present office of intelligence in combination with a strategy board, to plan the operations of the Department. The work of this so-called Committee of Conference determined in a very great degree the direction of the efforts of the Department for the whole war.

Another board, composed of old officers, sitting in a hotel in New York, was known as the "La Farge House Board." Very

little trace of it is found in the archives of the Department, but it seems to have been a permanent court of inquiry whose duties were to report on the conduct and capabilities of officers of high rank and to advise the Secretary as to appointments and punishments. It did not deal with minor cases or junior officers.

The supervision and co-ordination of the work of the Constructive Bureaus was given to the chief clerk of the Department.

When an Assistant Secretary was authorized an ex-naval officer was appointed to the position and his knowledge of naval operations enabled him to take charge of the conduct of the war and the operations of the fleet. That is to say, under the pressure of a great war the Secretary was obliged to organize his hitherto neglected powers for the conduct of military operations by assigning them to his Assistant Secretary who had professional knowledge. Besides, the work of the Secretary's office relating to the appointments of officers was turned over to an office of detail, and some of the bureaus were subdivided to decrease the labors of their chiefs. There remained to the Secretary as his special field (see Gideon Welles' Diary) the relations of the Department with the President and the public. The Secretary retained in his own hands the Department's dealings with Congress, the control of patronage at the navy yards and elsewhere, and the general policy of the administration as determined by the President and Cabinet.

But this development was not the work of an instant. At the outbreak of war all was in confusion, the Secretary, and even the best of the officers of the navy, had no proper idea of their respective relations with each other and to the Department, and it took some time to find out how the machinery of administration should be managed. Even in the late fall of 1861 the Secretary remarked that "the Department's views as to the attack on New Orleans were speculative and uncertain." But we see that in the end, under the stress of war, the Secretary had developed a system not unlike what we have to-day; the Assistant Secretary was the aide for operations, but with executive authority; the "La Farge House Board" corresponded to the aide for personnel, the chief clerk was the aide for materiel and the Committee of Conference was the General Board. The belief of so many civilian secretaries that the employment of the fleet and the management of the personnel called for no naval training was shown to be totally unfounded by the test of a great war. It was actually managed by an

ex-naval officer. But upon the conclusion of the Civil War all the superstructure erected upon the bureau system by executive authority crumbled. Only the bureaus, with some addition to their number, remained as the permanent work of the legislature. Even the office of Assistant Secretary created to control the military operations of the fleet was abolished by Congress. As there was no war it seemed to Congress that there was no need to maintain an organization ready for war.

The impression which remained with the public, however, and even to a great extent in the navy itself, was that the bureau administrative system, alone and unaided, had proved itself equal to the demands of a great war, and this monstrously mistaken idea has been largely instrumental in preventing any proper organization of the Department since then.

The Navy Department ran along under the bureau system, through twenty years of graft and inefficiency until public opinion authorized Congress to build an efficient fleet.

While the thought of most officers at this time was given to mechanical and administrative developments, the foresight of Rear-Admiral Luce was the means whereby the War College was established with the object of providing for things of the spirit rather than of the body.

A short time previously the office of Naval Intelligence had been founded. At the first, the organization of this office was arranged to follow the bureau work, but it soon appeared that the administrative and mechanical work of the Department was not the only side to its activities, and about the time the War College was started the office of intelligence changed its system of classification of work in recognition of the wider field with which it felt itself obliged to deal. Since that time, the War College and the office of intelligence have worked in support of each other, the one getting information from abroad as to the practice of foreign nations in regard to organization, mobilization, tactics and strategy, while the other institution utilizes the information, thus provided, in plans and studies for the guidance of our own forces.

When the war with Spain broke out, in 1898, the only plan for the war which the administration had was one worked out at this War College in the summer of 1895, and as it was the only one, at all carefully digested, it was perforce the one which both the army and navy followed. It is worth while to examine the broad features

of this plan as it has much which can be imitated with advantage now in similar work.

The essential point to be noticed is that it was a plan for the Department's guidance, in preparation for the campaign, rather than one for the commander-in-chief in his conduct of the campaign.

The conception that the plan is to direct the Department is at the foundation of any sound Departmental war plan or war portfolio.

All through our service in the navy we advance from subordinate duties to higher ones, with the consequence that we are more familiar with the work of our assistants which we have just ceased to perform than we are with our actual new duties which we are just learning. The result is a great and unfortunate tendency to meddle with details which are getting on well without our help, instead of devoting our attention to the broader questions of policy, direction and discipline which properly belong to us.

This error was avoided to a very considerable extent in the war plan formulated at this College in 1895 in expectation of the war with Spain. But upon the outbreak of the war it was necessary to pass from preparation to action, and the Department had the bureaus only for administrative work, but no organization for the strategic control of its forces. Accordingly, the so-called Strategy Board was extemporized to study the strategic situation and offer sound military advice upon current affairs to the Secretary and the President as commander-in-chief. But the government was totally unprepared for war, and so, the new Strategy Board being the only organized body ready to assume the duties of a general staff, it became the reliance of the government in matters strictly beyond the field of the navy just as had happened at the outbreak of war when the Naval War College plan was accepted by the administration because it met no competing plan.

When Shafter's army set out for Santiago the orders to its commander-in-chief were drafted, so it is said, by the Naval Strategy Board. This new body was the only organization either in the War or Navy Department that was unembarrassed by pressing administrative details. It being ready and willing, the President turned to it because nobody else was free to answer his demands. That Shafter did not follow his instructions is a matter which calls for no notice here.

After the Spanish War, the Strategy Board, a temporary organization, lapsed, and the Department once more refused to admit that it had duties other than administrative. But this attitude did not last long. The General Board was soon organized for the purpose of dealing with the military duties of the Department. Owing to the prestige it owed to its president, the admiral of the navy, this board has been able to hold its own and even to improve its early position as the military branch of the Department in spite of the jealousies and fears of the administrative bureaus.

But progress in the Department's organization for securing military efficiency in war continued, and under the present administration the military duties of the Secretary, as distinct from his civil duties, have been more fully organized than at any time since the foundation of the Navy Department.

The work of the Navy Department naturally falls under five general headings, which may be described as Civil Service, Naval Materiel, Naval Personnel, Inspections, all of which are administrative services and lead up to and support the military branch of "Operations of the Fleet." These natural divisions have been recognized in the recent changes in the organization of the Department.

It will be interesting to glance aside for an instant at the organization of the German Admiralty. Although it is impossible for this country with its institutions to follow the system of a military monarchy, yet the efficiency of the German Navy is so high that we cannot fail to profit by comparing its system with our own.

In the organization of the German Navy there are three grand divisions each of which is directly subordinate to the Emperor as commander-in-chief. The first branch is the Imperial Naval Office corresponding roughly to the American bureau system. The Imperial Naval Office supplies raw material for the navy, including recruits, new ships, war material and supplies of all sorts. The second branch is the Imperial Naval Cabinet, corresponding roughly, but not fully, to the office in our Navy Department under the aide for operations, known as "Operations of the Fleet." The Naval Cabinet supervises the fleet in commission and other naval organizations, and turns the raw material supplied by the naval office into efficient ships and fleets.

Every man and ship in the German Navy belongs to one of six great commands at the head of each of which is an admiral who is in direct communication with and responsible to the Emperor

through the Naval Cabinet for the efficiency of his command. This efficiency is developed chiefly through the powers of appointment, promotion and retirement exercised by the Emperor through the Naval Cabinet upon the recommendation of the commanders-in-chief. The tenure of the commanders-in-chief themselves depends upon the appearance and proficiency of their commands at the Imperial Naval Maneuvers every autumn.

Thus the efficiency of the German Navy depends upon decentralization and discipline exercised through the power of appointment and removal rather than upon centralization and narrow rules required by our system where disciplinary removals for lack of efficiency are comparatively unknown.

The third branch is the Imperial Admiral Staff, whose chief corresponds in part to our aide for operations. The duty of the Admiral Staff is to utilize the military forces supplied and trained by the other two branches. It deals with the duties performed by our Office of Intelligence, War College and General Board.

I have brought forward the German organization for comparison with our own because the former is more logical and precise; but our attempt is to provide for the performance of the same duties as those of the German General Staff.

In the development of the American Navy during the last thirty years the attention of the service has been centered on mechanical and administrative development, and we have neglected the corresponding development of the study of the preparation for war.

But it is now high time to accept the material development of our navy as equal to that of others, and, contenting ourselves with sufficient effort to maintain the situation in this respect, we must turn to the study of operations of war and strategic preparations therefor as the most pressing need of the day.

Broadly, of the three organizations which, under the aide for operations, do the strategic work of the navy, the first, the Office of Intelligence, acquires information in regard to probable enemies.

In the past, owing to the general exaltation of matters appertaining to material, the Office of Intelligence has devoted the greatest part of its efforts to gleaning secrets relating to ships, armament, organization, and such details, whereas we should now recognize that its chief concern in the future should be to get such information as will be serviceable in preparation for and during war. We want the Office of Intelligence to provide us reliable news during

the war of all that pertains to the enemy's plans and movements; we want a secure and secret means of communication through neutral countries. We need plans of fortified ports, and particulars as to the enemy's plans for mobilization, and in general what he can do at the outbreak of war and how much time he will need to make his preparations.

The duty of the General Board in preparing the navy for war is, first, to ascertain what demands the national world policy is likely to make of the navy, and to lay down the numbers and the types of ships necessary to accomplish the navy's mission. In the second place, the General Board makes out the necessary plans for war. It is necessary to have a clear idea as to what such plans are.

The plans for war are of two classes, strategic and administrative. The administrative plans embrace those necessary for feeding the war in various theaters. They include arrangements for recruiting, purchase of ships, fuel, ammunition, etc., as well as for repairs, for handling sick and wounded, supplies of provisions and clothing. It is the business of the bureaus to furnish all that is necessary. It is the business of the General Board to consider what will be necessary. The board draws up the requisition, the bureaus execute it.

When we pass to strategic plans they rest on the relative forces of the enemy and of ourselves; on the relative times at which these forces can be brought into action, and the certainty and continuity of their supplies. The basis of our strategic plans will therefore by necessity be careful studies of the relative strengths and times in which the enemy and ourselves can appear in various theaters of war. In technical language the foundation of our strategic plans are the mobilization studies made for both sides. When these are once thoroughly made they are semi-permanent, for the changes in national strength and sea communications are of slow development.

The data for the mobilization studies of the enemy will be furnished by the Office of Naval Intelligence; those for our own forces by the bureaus of the Department. All the data will be worked up by the plan making branch of the navy, namely, the General Board.

When the first tentative strategic plans for a given theater based on these mobilization studies are drawn up, it will no doubt become apparent that certain improvements in mobilization will greatly improve our strategic situation. It will then be the duty of the General Board to point this out to the Secretary, who will

doubtless give administrative orders to the bureaus to do all they can in the direction suggested; and he will further ask Congress for necessary assistance. But in all this plan making it is to be noted that the General Board is making plans for directing and guiding the administrative work of the Department in preparation for and during war. It is not to do the work of the bureaus; it is merely to examine and report what they will have to do to wage successful war.

Before war becomes imminent the General Board, as the plan-making branch of the navy, should have very little to do with formulating strategic plans for the commanders-in-chief. Indeed, it cannot do so with a degree of certainty; the strategic conditions cannot be foreseen far ahead. The forecasts of the enemy's mobilization will not be correctly made, nor will those for our own forces; and all must be modified more or less during the period of strained relations so that a war portfolio drawn up in a period of untroubled peace should not attempt to formulate any detailed plans as to the control of the commanders-in-chief. Nevertheless it is very desirable that several variations of strategic plans should be worked out to meet whatever conditions seem most likely. When war approaches, one of these tentative plans will be selected and modified as necessary to accord with the most recent data as such is received. But in any case, the Department should avoid hampering the commander-in-chief by too much detailed instruction. The Department should indicate its objective; the method of attaining it should be left to the commander-in-chief.

All the preceding remarks regarding the history and present organization of the Department have brought us to the War College and its position in the general system.

We have seen that in the past the views of the Department on the conduct of war have been (again quoting Secretary Welles' words) "speculative and vague." This uncertainty as to what is best to do has been reflected all along the hierarchy of the navy. No two people have had similar ideas as to dealing with a given military situation, even a minor one.

When the commander-in-chief has given a tactical order, he has accompanied it with a flood of explanatory comment; instead of an order it has been unfortunately a lesson.

But when we wage war there must be prompt team work. Every man occupying a position of detached command must understand

the principles which govern his coadjutors. If this is not the case there will be confusion and disaster.

We see this well exemplified in the season's work of a foot-ball team.

The team learns to play before it goes to its great match. Up to that time, the coach makes a lesson of every movement and each error occasions a repetition. One team may have one style of game and another team may have another style; but, for better or for worse, every one in a given team knows how he is expected to play his own part and assist the others. Similarly, for war, we must train all the navy to understand and carry out some one method of making battle and war. If before war we have not agreed upon the general method of conducting it we shall have tactical anarchy. The commander-in-chief will not be able to carry out his ideas without accompanying every order by an explanatory lesson. The days will not be long enough for him to conduct his school and when the enemy appears the battle will show his scholars unable to pass their examination.

It is the object of the War College to do as much strategic and tactical thinking for the navy as possible before the outbreak of war; as a result of its studies, it teaches a doctrine of war which embodies sound professional practice. In this way through its teaching and training the College unifies the professional thought of the service in regard to strategic and tactical matters, by turning out each year a number of officers who take the same views of tactical matters. As a consequence, they will act in harmony when war comes. The method followed in instruction is to deal with concrete problems of war, until the people solving the problems do so readily. In this applicatory system the mental processes followed in considering and solving each situation are identical with those of real war.

When we have worked out many of these problems with thought and patience, solution of new ones becomes easier; and, when war comes, although responsibilities are greater, we do not find ourselves utterly unfamiliar with the ideas then before us. The case is like that of sub-caliber practice, where the dotter practice makes us familiar with the mental processes of shooting before the great guns are actually fired. But side by side with this development of doctrine for the co-ordination of effort the exercise of problem solving has the effect of building up and strengthening of indi-

vidual character to bear the responsibilities of war. Without practice, the ablest officer cannot show the high qualities necessary to command. He cannot readily get this practice except in war, but in the desk exercises of problem solving he has a tolerable substitute. A man bearing the responsibility of a campaign is naturally somewhat overcome thereby and is consequently inclined to be shrinking and timid. But a course in problem solving increases his boldness and self-reliance in meeting the conditions of war and he dares to act because he has learned to have confidence in himself and so he accomplishes something towards developing and increasing that " resolution " which is the soul of great commanders. In war, as Bonaparte said, the moral factors compared to the physical ones are as three to one, and an additional beneficial result of problem solving will be found in the development of confidence and morale in the men of the command as a reflection of that acquired by the commander through school-room exercises in tactics and strategy.

To recapitulate, the Navy Department from the very first has had an administrative side which has worked up the raw material of men and ships into a homogeneous trained and disciplined fleet, but it has always suffered in past wars because it had never been organized to conduct them, and the navy in peace time has never given much thought to preparation for hostilities.

Recently, the Department has organized itself by establishing a military branch for the conduct of war. This College forms a section of this military branch whose duty is two-fold, namely, to develop the capacity of individual officers to conduct war-like operations, and further to develop a uniform doctrine of making war throughout the navy so that we may all feel confidence in each other's capacity, and know what our comrades are likely to do in given situations, and so enable us to act promptly and boldly because we know that there will be good team work in support of each other.

The Naval Academy trains very young men for their administrative and technical duties as officers in time of peace. The course of study there fits officers to make and maintain their commands efficient both in peace and war. The War College is for older and experienced officers to train them and develop their moral characters to assume the responsibility of war and directing its operations.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

DISCIPLINE IN THE NAVY.

By CAPTAIN MARBURY JOHNSTON, U. S. Navy.

The subject of discipline in the navy has been discussed so often in the NAVAL INSTITUTE PROCEEDINGS by officers high in rank, and reputation, that I feel a natural diffidence in placing my views before the service. Still, I feel that I have a message for the service at large, and that it is my duty to speak out in meeting, though my ideas are diametrically opposed to those of a great many officers who have discussed this subject.

Up to the time of the Spanish War the character of the enlisted force of the navy was practically the same that it had been for fifty years; most of the men were picked up in the sea ports, and our apprentice system turned out five or six hundred boys a year from the training station at Newport. These apprentices, after a year at Newport and six months cruise on a training ship, were sent out to serve on cruising vessels. Young and impressionable they found (or thought they did) that it was the proper thing to get drunk and break their liberty. Most of them followed the example set by the older sailors, and of the few who did not, many became warrant officers, and some have commissions to-day.

With the Spanish War came a great change—Congress appropriated money for battleships, and more battleships, and still more battleships. The enlisted force grew by leaps and bounds. It became necessary to leave the sea coast and go inland with recruiting parties to get the men necessary to man the ships. In a very few years the entire character of the enlisted force of the navy changed. The young man predominated. When the U. S. S. *Washington* was placed in commission the average age of her enlisted force of eight hundred and fifty men, was a trifle under twenty years. One Sunday afternoon in 1906 I visited the Metropolitan Museum of Art in Central Park, New York; the fleet was in North River and I saw scattered through the

different rooms at least one hundred sailors in uniform. Clean, clear cut, picturesquely dressed, they wandered through the rooms studying the catalogues which nearly every one of them had bought; absolutely unconscious of the attention they attracted and of the fact that they were doing something that sailors were not expected to do. I went away with a feeling that if the navy could be made up entirely of such men, what a navy we would have! I am of the opinion that we can have a navy composed entirely of just such men; this article is written to show how that end can be accomplished.

It is unfortunately true that a great many men who are natural leaders, and have forceful characters, are morally bad. They exert a bad influence on boys and men who have less strength of character; they are at the root of nine-tenths of the liberty breaking and other serious infractions of discipline, and they should be kicked out of the service at the earliest possible opportunity. Too much stress is laid upon the possibility of reforming these bad ones. The navy is not an eleemosynary institution—it is a fierce business proposition, and to get results we must use business methods. No business corporation or factory would temporize for a minute with employees who have failed to show up at the proper time for work—why should the navy?

Twenty-five years ago men of the navy were enlisted for special service in the Coast Survey and Fish Commission; the commanding officers of those vessels could discharge a man whenever they saw fit; if a man misbehaved, he was paid off, given his bag and hammock, and put on the beach at once. This resulted in better discipline and more contented and happy crews than I have ever seen on a man-of-war. The captain rarely had to use his power because the men knew exactly what they would get for any serious misconduct.

In January, 1889, I succeeded temporarily to the position of executive officer of the Fish Commission Steamer *Albatross,* and performed the duties for one year. We had no brig and the police force on board consisted of one master-at-arms. When men got drunk and disorderly we had to put them in double irons and chain them to stanchions on the berth deck. Shortly after I became executive there was an outbreak—the men got possession of some of the alcohol in the laboratory and so many of them got drunk and disorderly that the stanchions gave out. I had served in the

coast survey eighteen months just previous to joining the *Albatross* and remembering how such cases were handled in that branch of the service, I suggested to the captain (the late Captain Z. L. Tanner) that we try the coast survey method. He demurred at first, saying we could not keep a crew, but I was so positive he finally gave in and gave me permission to try it. The next Sunday at muster the men were informed of the captain's decision that any one who broke his liberty for more than six hours, or got drunk, or committed any serious offense, would be discharged at once as undesirable.

The following (Monday) morning I found that Hansen, chief quartermaster, was absent over time. Hansen had charge of all the sounding machines and was the expert splicer of sounding wire. He was the kind of man who gets to be regarded as indispensable. When his six hours were up his discharge was made out, and when he returned twenty-four hours over time he was the most astonished man on the Pacific Coast when he was given fifteen minutes to pack up and get over the side. That ended all misconduct on the *Albatross*. During the rest of my stay on the ship we never had to discharge another man for that reason. On a coast survey vessel, whose crew consisted of twenty-five or thirty men, the discharge of a single man made as big a hole in the crew as the discharge of thirty or forty men would on a modern battleship.

Something has been done in the service in the way of changes in laws and regulations to meet the new conditions existing since the Spanish War. Congress has passed laws doing away with "irons, single or double," and establishing deck courts. The regulations have been changed so that a man gets his month's pay no matter what his conduct has been, and liberty and leave have been given, whenever the circumstances permit, with a generosity that shuts out all criticism.

The act of Congress doing away with irons was a most excellent one. Few captains ever used irons as a method of punishment, but the articles of war required that a summary court-martial, in giving a sentence of confinement on bread and water, should include irons, single or double, so it was necessary that the law should be changed. The doing away with irons was a great advance in ameliorating the condition of the enlisted man (in hard luck).

The establishment of the deck court was a distinct step backward; in the first place it is a temptation to too many captains to shirk their duty and turn it over to the deck court officer; in the second place its sole function, in practice, is to fine an offender and take away his pay. This is the most fertile cause of dissatisfaction in the navy. When a man enlists, he signs articles in which the government agrees to pay him a certain sum per month, or the pay of the rating to which he might be promoted, the man agreeing to serve a certain length of time and to obey orders and regulations. I do not question the legal right of the government to break its contract, after the man has broken his, I only question the expediency of it, and suggest that when the man fails to carry out his part of the contract, the proper remedy for the government is to abrogate the contract.

I know the old argument that if you discharge a man for misconduct, those that want to get out will misconduct themselves for the purpose of getting their discharge. Very well, I say, give them their discharges (bad conduct or undesirable) and let them go, they are no use on board ship if they are dissatisfied, and they work on weaker natures and make them dissatisfied too.

My idea is to discharge every man for his first serious offense. If he is a good man and offers a plausible excuse for his offense and it is thought that a warning may save him, give him one more chance. But don't give him a deck court or summary court-martial and fine him. If you do that he will feel that he has expiated his offense and is entitled to the privilege of repeating it. Simply warn him and discharge him immediately should he offend a second time. Just as soon as the men of the service find out that all liberty breaking and serious infractions of discipline will be punished by immediate discharge as undesirable, just so soon will it be stopped.

Since the Navy Department has authorized the discharge as undesirable of one per cent of the crew each quarter, I have made it a practice to ask men at the mast whost records were bad, if they wished to be discharged—in seven months I have had only one affirmative reply.

In signing up the enlistment records in January last, for the preceding quarter, I was struck by the very large number of court-martials on some of the records—two men had six each (they also had twenty-six and twenty-eight years continuous service, respectively), one man had five, several had four, and about forty had

three. I had these men mustered on the quarter deck and told them that they had reached their elastic limit—that if they offended again I would do my best to see that they got bad conduct discharges; only two men out of that lot have since committed themselves and been discharged.

The navy at present presents a career for any young man, the men are well paid, well fed, and well amused; most of them are well satisfied. They do not wish to leave the service with a bad conduct or undesirable discharge. They recognize that an honorable discharge is a valuable asset. It means four months pay if they re-enlist, it means preference in obtaining employment at a navy yard, and it has great weight in securing a position in the fire department or police force of the large cities. It is also something that a man can show with pride when he returns to his home. The class of men we get in the navy now-a-days recognize these facts. All that is needed to make the discipline of the navy what it should be is to start the steam roller and threshing machine, crush out the bad ones and winnow out the worthless ones.

Let us assume that the Navy Department agreed with my ideas, and issued the necessary orders to carry them out—what would be the immediate result?

1. The military offense of desertion from the navy would cease to exist. A man on a spree finally dies or he gets sober. If he dies, that ends it. When he gets sober he will give himself up and take his undesirable or bad conduct discharge and save his citizenship. If he does not do so, and is apprehended and delivered up to the naval authorities, he should not be punished for desertion, but sent to St. Elizabeth's or some institution for the feeble minded. Fraudulent enlistment is a thing of the past. The finger print method of identification and the printed slips attached to bad conduct and undesirable discharges, warning men that they are sure to be identified and punished for fraudulent enlistment has made this offense very rare.

2. Our military prisons at Portsmouth, N. H., Boston, Mass., Port Royal, S. C., Mare Island, Cal., and Puget Sound, Wash., would have to be closed as we would have nobody to confine in them. Men convicted of criminal offenses should be sent to state penitentiaries or to United States' prisons.

3. The officers and men on duty at the above institutions would be available for other duty.

4. The deck court officer and the members of the permanent summary court which exists on every ship in the navy of any size, would find more time to devote to their regular duties.

5. General courts would only be required when crimes are committed.

6. The military part of the office of judge advocate-general would have so little work that three-fourths of the officers now on duty there could be detached and sent to other work.

I have named the above because they are obvious, and because the first objection to my plan will be its cost. The real value of my scheme lies in the increased happiness in the navy and the resultant increased efficiency. An over night liberty party of four hundred men leaving a battleship at a navy yard loses from five to eight per cent of their liberty time because the officer of the deck has to line them up, inspect them, and check them over the side. If we only had men we could trust, a man ready to go on liberty could turn his name down on a board in his part of the ship, report to the officer of the deck and walk ashore. This is only one of numerous instances in which the disciplinary rules of the ship, now necessary, might be relaxed for the comfort and happiness of the crew—if the crew were all good.

The very large annual saving made by doing away with prisons would more than offset the cost of the extra recruiting parties that would have to be placed in the field at first. I say "at first" because I am firmly convinced that, in a very short time, there would be fewer discharges for misconduct than we have at present. After getting rid of the bad ones, the discontented ones, and the worthless ones, the people who take their places will have no bad examples to lead them astray, and the only people to be discharged would be the small percentage of mistakes made by recruiting officers.

There is one small fly in the ointment, and yet I'm not sure whether it's a fly or merely another ingredient which will add to the curative powers of the ointment. I mean the extra work that will be put upon the Navy Department in handling the requests of Senators and Congressmen to reinstate their constituents in the navy. If the Secretary should decide on a policy of granting these requests, we might have to discharge a number of men more than once, but a great many reinstated men would feel that they owed their Congressman something, and they would become available men. Then, too, the Congressmen would feel friendly toward the navy if his requests were granted.

The navy is very conservative; it is natural that it should be so. When any change is proposed, the opinion is asked of officers of rank, age and experience. Age and experience are always conservative.

One hundred years ago the European navies recruited their crews by means of the press gang. Samuel Johnson is credited with saying that no man went to sea who had ingenuity enough to get sent to jail, as in jail he would have just as good company, and more safety. But times have changed. Men are no longer fed on salt horse and weevily biscuit. They are not kept on board ship for months and years at a time without being allowed to go on shore. Their wants, comforts, and amusements are carefully looked out for. But in some things we are still back in the days of the press gang. We fall down and worship this fetish of the sanctity of the enlistment contract. We make it hard for a man to get out of the service. Even if a man wants to buy his discharge, we require all kinds of affidavits, and an amount of time is frequently consumed which works a real hardship on the families of deserving men. If we made it easy by getting rid of those who misbehaved, we would soon be in a position to turn around and raise the physical and educational qualifications of the new men we enlisted. I don't think that I exaggerate when I say that nintey per cent of the men in the navy want to stay in it, and finish their present enlistment at least. With the bad ones gone, the re-enlistments would double and treble.

A famous Secretary of the Treasury said "The way to resume specie payments is to resume." The way to get rid of liberty breaking is to get rid of the liberty breakers.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NAVY YARD PROBLEMS.

By ASSISTANT NAVAL CONSTRUCTOR J. E. OTTERSON, U. S. Navy.

Motto: Consider the Consequences.

ALTERATIONS TO NAVAL VESSELS.

In undertaking alterations to naval vessels we are governed by three considerations: (1) necessity; (2) practicability; (3) cost.

The necessity is determined by the reasons which suggest the alterations. These reasons may be classified as follows: (1) military; (2) mechanical; (3) structural; (4) economical; (5) sanitary; (6) convenience and comfort.

The practicability of an alteration is determined by the ease with which the mechanical and structural difficulties can be overcome and the interferences removed.

The cost of an alteration is dependent to a large degree upon the practicability and is justifiable only if there is sufficient gain in military value, in mechanical or structural perfection, in economical operation or maintenance, in sanitation, convenience or comfort.

The burden of proof of the necessity for an alteration rests primarily with the official suggesting it. In general, alterations subsequent to the final commissioning of a ship are made necessary only by a change in conditions.

The demonstration of the practicability of an alteration rests to a certain degree with the official suggesting it, but since, as a rule, he has not at hand the expert knowledge or means with which to work out plans or make calculations, the final demonstration must rest with the bureau or the navy yard. However, the practicability, in so far as the means at hand permit, should receive most careful consideration before the recommendation goes forward, and the mechanical or structural difficulties to be over-

come and the interferences to be removed should be clearly defined even though the means cannot always be suggested.

The estimate of the cost of the alteration must, in general, be made by the navy yard, since this work requires an inspection of the local conditions, the preparations of plans and calculations, use of records and data, knowledge of output of machines and men, pay of workmen, and cost of materials.

The above suggests two distinct steps in presenting an alteration for final approval: (1) proof of necessity and preliminary demonstration of practicability; (2) final demonstration of practicability and determination of cost. In taking the first step, the item should be considered for the ship recommending; then for the division, and finally for the fleet.

In order that the work of performing the second step may be saved whenever possible, it is desirable that the item should be submitted for preliminary approval upon the completion of the first step. If preliminarily approved, the second step may then be taken and the item submitted for final approval.

It is desirable in all cases that the approval should be by central authority and not by local authority. This is necessary in order that military, mechanical, structural, economical and sanitary standards and principles be maintained.

The above discussion suggests a routine for submitting recommendations for alterations somewhat different than the present practice.

The commanding officer submits the recommendation to the division commander, defining it as clearly as possible, stating the objections to the present installation and the advantages of that recommended, showing the necessity for the change and demonstrating its practicability.

The division commander examines into the matter and submits this letter for comment and recommendation to other commanding officers of his division, who recommend as to the necessity and practicability of this alteration on the vessels under their command.

The division commander then submits a letter to the commander-in-chief, recommending for each ship of his division.

The commander-in-chief submits the matter to the commanders of other divisions who take it up with their commanding officers, each commanding officer in turn submitting recommendations to

the commander of his division, and the commanders of divisions to the commander-in-chief.

The commander-in-chief considers the matter and submits a recommendation for the fleet, pointing out the differences in the requirements of the various ships. This recommendation goes to the bureaus concerned for preliminary approval, based on bureau standards.

The bureaus having approved, the alteration is sent to the various yards "preliminarily approved, subject to considerations of practicability and cost." This preliminary approval may be accompanied by type plan.

The yards draw up plans and estimates and submit for final approval to bureaus.

The bureaus pass upon and make final recommendation to the department.

The department gives final authority and the yards are directed to proceed with the work.

The original letter of the commanding officer does not go beyond the division commander; the letter of the division commander does not go beyond the commander-in-chief. The bureau, the department, and the navy yard, are thus saved the great burden of considering the letter of each commanding officer separately, and consider merely a single letter for the fleet, with certain recommendations applying to each class of vessels. In this connection, it should be borne in mind that an alteration that is proper for one vessel is proper for all vessels of the class.

We are thus assured that the views of each commanding officer will receive the full consideration of all commanding officers, division commanders, and the commander-in-chief; and when a recommendation for alterations comes forward it will mean that the necessity is pretty generally felt by the fleet. Alterations are thus considered fully by those charged with operations and by those charged with the design and maintenance of standards; and the preparation of detailed plans and estimates involving so much work and expense is reduced to a minimum. It is extravagance to waste time on estimating upon items which will be disapproved from other causes than the question of expense. Such cases may be: (1) violation of engineering or architectural practice or principles; (2) insufficient funds under the appropriation, requiring that the item be carried over for another year; (3) departure

from departmental policy as regards the extent of alterations to be: (1) violation of engineering or architectural practice or military or other designs, developed or contemplated; (5) reasons for requesting not sufficiently good; etc.

There is given below a list of fifty alterations which have been requested by various ships. While this list is by no means complete, it is fairly representative and typical; the items being taken at random without regard to the class in which they fall. The list represents the total number of different alterations included in several ships' letters, no items having been omitted for the purpose of influencing the lists. There may be some question as to the proper class of each alteration but the classification given is made after a consideration of not only the title of the alteration but of the result obtained by making it as well.

In the following table, attention is invited to the percentage that each class forms of the whole.

Military alterations form a fairly high percentage, though not as high as might be expected. In general, the necessity for military alterations increases with the age of the ship, provided it is desired to keep it on equal footing with later ships. To the same or greater degree, the advisability of military alterations decreases with the age of the ship, because the changes necessary to keep her up to date become greater as departures from her type become more radical. Shortly, the cost proves greater than the advantage gained, and she is permitted to fall below the standard and pass out of the first line for economic reasons.

The necessity for mechanical and structural alterations should be greatest in a short period immediately after the first commissioning of the ship. No attempt is made here to fix definitely the length of this period, but six months would seem a reasonable time in which to develop mechanical and structural defects. After this period, the only alterations of this character should be those due to the invention or development of improved apparatus; and the wisdom of making these is dependent largely upon the extent of the gain and the age of the vessel. In general, it should be true that any apparatus which has served the purpose for a number of years should not be replaced by some newly developed apparatus for no other consideration than mechanical or structural improvement or perfection. There should be some accompanying military or economic gain.

Alterations to Various Ships	Military	Mechanical	Structural	Economical	Sanitary	Convenience and comfort
1. Foundation for evaporator pump	..	..	1	..	..	..
2. Ammunition rails	1	..	..	..	..	..
3. Change in boat stowage 40 ft. steamers	1	..	..	..	..	..
4. Enlarge butcher shop	..	..	..	..	..	1
5. Wearing plates under coal hatches	..	..	..	1	..	..
6. Ammunition trolleys	1	..	..	..	..	..
7. Evap. room drain to sanitary line	..	..	..	..	..	1
8. Firemen's wash troughs	..	..	..	1	..	..
9. Ventilation isolation ward, etc	..	..	..	..	1	..
10. Rehinging hatches	..	..	..	..	..	1
11. Balance gear on eng. room hatches	..	1	..	..	..	..
12. Metal uprights in magazines	1	..	..	..	..	..
13. Rearrange bakery shelving	..	..	..	..	..	1
14. Change coal box in bakery	..	..	..	..	..	1
15. Galley warming oven	..	..	..	..	..	1
16. Draft gauges	..	..	..	..	..	1
17. 3-inch guns shifted	1	..	..	..	..	..
18. Closing smoke hatches	1	..	..	..	..	..
19. Voice tubes torp. defense	1	..	..	..	..	..
20. Plotting and subs. rearrangement	1	..	..	..	..	..
21. Cold-storage rearrangement	..	..	..	..	..	1
22. Drains and scuppers	..	..	..	..	..	1
23. Eductor for after bathrooms	..	1	..	..	..	..
24. Ventilation of brig	..	..	..	..	..	1
25. Ventilation of torpedo rooms	..	..	..	..	..	1
26. Bread locker	..	..	..	..	..	1
27. Change location of life buoys	..	..	..	1	..	..
28. Battle dressing station	1	..	..	..	..	..
29. Bridges and director station	1	..	..	..	..	..
30. Storage battery room	..	..	..	..	..	1
31. Magazine sprinkling	1	..	..	..	..	..
32. Oil stowage	..		..	..	..	1
33. Chafing plates under hawse pipes	..	..	..	1	..	..
34. Removing ram plates	1	..	..	..	..	..
35. Electric steering gear	..	1	..	..	..	..
36. Remove fire-proof wood and furniture	..	..	..	..	1	..
37. Additional coal scuttles	..	..	..	..	..	1
38. Blower foundations	..	..	1	..	..	..
39. Central station	1	..	..	..	..	..
40. Remove torpedo tubes	1	..	..	..	..	..
41. Searchlight platforms	1	..	..	..	..	..
42. Range-finder platforms	1	..	..	..	..	..
43. Ammunition hoists	1	..	..	..	..	..
44. Ventilation of substations	..	..	..	..	1	..
45. Cross connections in water service	..	..	..	..	..	1
46. Location of compass and steering wheel	..	..	..	..	..	1
47. Additional lockers and shelving	..	..	..	..	..	1
48. Turret officers' booths	1	..	..	..	..	..
49. Turret gear changes	1	..	..	..	..	..
50. Gas ejecting	1	..	..	..	..	..
Totals	20	3	2	4	3	18
Per cent	40	6	4	8	6	36

Economical changes result from the improvement in apparatus or material which produces more efficient operation or better wearing qualities. Such changes are always welcome and are most advantageously made when the old has worn out.

There is some danger of sanitary changes being made too readily, as it is hard to resist anything brought forward in the name of sanitation. It is to be noted that the percentage is small for so worthy a cause.

Convenience and comfort: There is quite a little personal feeling and opinion in this class of alterations. What one man feels as necessary may not appeal to another as such. In general, the necessity and advisability of such alterations should decrease with the age of the ship. Inconvenience and discomfort of a serious nature will be removed in the early days of commissioning, and those which require eight or nine years to discover cannot be very serious.

There may be some confusion or difference of opinion as to which class the various alterations belong. This is due chiefly to the tendency to consider them all military, in that they constitute alterations to a military instrument, and, regardless of the cause for their necessity, tend to increase the military efficiency. The military alterations should be considered as limited to those which change the strictly military features of the ship.

The purpose of the above is to suggest a uniform, standard method of considering alterations, to ensure that alterations will receive full and proper consideration by all concerned, that standards will be maintained, that data may be collected and preserved for future designs, that the action on one ship may be made general for all ships to which it applies.

Perhaps the most important feature is the more general consideration of alterations by those charged with operation. In order that this feature may be further developed, it is suggested that there be organized a "Fleet Board on Alterations," composed of the fleet staff, namely, the fleet engineer, fleet ordnance officer, fleet paymaster, fleet medical officer, and fleet naval constructor. This board to meet periodically to investigate and consider proposed alterations, making recommendations to the commander-in-chief. The findings of such a board should represent the actual needs of the service and should assist materially in standardizing and perfecting our ships, and the development of future designs.

THE NUMBER OF OUR NAVY YARDS.

The purpose of our navy yards is two-fold:

1. *Industrial.*—The economic accomplishment of repairs and alterations to our fleet in peace times so as to keep it in a condition of constant preparedness for war.

2. *Military.*—The expeditious docking and repair of our fleet in war time so as to keep it constantly ready for action.

If we consider only the first purpose, namely, the economic maintenance of our fleet in peace times, I think that there can be no escape from the conclusion that we have too many navy yards. Since all of the yards must be equipped for general work and cannot specialize, it is certain that consolidation will effect economics as it has in so many lines of private industrial enterprise.

The problem of building up a single navy yard capable of replacing three or four of our present yards is such an enormous industrial undertaking that it would doubtless be many years before the full benefits would be derived from the consolidation. The choosing of the site is, in itself, a problem of considerable magnitude. Its location in the neighborhood of our large cities is practically prohibited by the value of land along the waterfront and the increasing demand for this land for commercial purposes. Our large sea-coast cities are already calling for more dock space. Thus forced to some undeveloped locality, it means that we must build not only a navy yard but a city, since there will be some 12,000 to 15,000 men to house. The labor problem will be somewhat complicated by the fact that such a yard cannot furnish steady employment to its maximum number of men and must therefore draw on the labor of surrounding industries. If there are no surrounding industries, we must at some time be embarrassed by the absence of sufficient competent labor to even a greater extent than at present. Navy yards have frequently urgent calls for commercial material, at which time it is quite convenient to be near the market for such.

A problem deserving serious consideration in our navy is the granting of leave to our enlisted men. It is not sufficient to spend a week or so each year in the vicinity of a large city where the men can find pleasure and recreation. We must have liberty periods as regularly as we have drill periods or repair periods. Now, in order that too much time may not be lost from drills and

manœuvers, it is desirable that the liberty period coincide with the repair period. Liberty can best be given in a large city where the men can find sufficient amusement and entertainment to keep them from dissipation and vice. This forms, then, an argument in favor of locating our navy yards in the vicinity of large cities.

The site chosen must be amply fortified, as it will become a point of great military value in war time. In order that the expense of building new fortifications may not be prohibitive it is desirable that a site be chosen which is already fortified. It is doubtful if an available one can be found that is amply fortified. It may develop that the capital invested in new fortifications and the expense of maintaining them will more than absorb the saving to be effected by the increased industrial efficiency resulting from the consolidation. The matter of fortifications is, of course, on the military side of the question, but the expense of such fortifications forces us to consider them along with the economic industrial problem.

We will suppose then that the industrial problem has been solved; that a site has been found which is suitable; that the economics gained by consolidation outweigh considerations of poor labor field, and distant material market; that the cost and maintenance of increased fortifications still leaves a balance and we have decided to move.

Let us pause and consider the second purpose of our navy yards: "Expeditious docking and repair of our fleet in war time."

War breaks out. Industrial economy is lost sight of in the frantic call for military expedition. If our navy yards have fulfilled their peace-time function and our preparedness is real, there should be no mad rush in the early days, except the destructive work of removing a little top hamper and peace-time conveniences. Dry docks and coaling stations are somewhat in demand; stores are needed quickly and in great quantity. In order to save time, all these things should be done at once and not in sequence; and with our whole fleet or half our fleet assembled in one navy yard it will be a busy little place, and consolidation will begin to show a few disadvantages.

But the real test is not yet. A modern war between two nations of about equal naval strength will scarcely be decided in one engagement. The first tilt having been decided, the problem is to prepare for the next. The contestant that can repair its fleet and

assemble it on the firing line in the shortest time has an enormous advantage. A few days at this time mean the enemy's commerce, the establishment of an effective blockade, the capture of some important strategic point; in fact, may decide the war.

Our crippled fleet returns, a demolished conning tower to rebuild, a few turrets jammed, a few guns to be replaced, a mast to be rebuilt, a number of holes to be patched, armor plates to be replaced, power leads and pipe lines to run—in all, an enormous volume of work to handle in the shortest possible time. Dry docks, piers, cranes, tugs, barges, coal, stores, men, power, material, and above all, *time* will be in demand. Can it possibly be argued that under such circumstances we would find a single large navy yard preferable to three or four smaller ones? It seems self-evident that confusion could be minimized and time saved by distributing this great volume of work, that expansion to meet the call could better take place at four points than at one. We can here apply to an exaggerated degree the argument of certain traffic experts who claim that large volumes of traffic are more expeditiously and comfortably handled from a number of properly distributed stations than from a single large station. One need only struggle along the approaches to any of our large railroad stations in rush hours to be convinced of this.

I venture to state, therefore, that military expedition in war time demands distributed navy yard strength as opposed to consolidated navy yard strength.

Let us consider another emergency that might result from the first or subsequent engagement of opposing fleets. The enemy's fleet breaks through; our fleet is pushed aside and left in crippled condition; the victor presses his advantage and proceeds to the attack and capture or destruction of our consolidated navy yard. We are embarrassed and find "all our eggs in one basket" and the situation becomes quite serious. How much more secure we would be with our navy yard strength distributed to four or more points, each lying secure behind the fortresses that defend our cities!

Suppose under a plan of consolidation we substitute one navy yard for two. It would then be as easy to deprive us of our whole navy yard strength as it had been to deprive us of half our navy yard strength.

It may be argued at this point that with a number of navy yards

it is necessary to separate our fleet into an equal number of units in order to effect repairs, and that with such a divided fleet the enemy could attack and demolish each unit in turn. It should be borne in mind, however, that in an engagement between two modern navies it is scarcely possible that either of the contestants could escape without the loss of a number of ships and the more or less serious crippling of all of them. In other words, each side will be materially weakened by the encounter.

Suppose that the enemy's fleet is in such condition that they need send only half of their remaining ships for repairs, whereas our own is so crippled that all must seek repairs and that for this purpose we break it into four equal units, each going to a different navy yard. This would leave the enemy with half its strength with which to bottle up any fourth of ours, but as our enemy's base could be no nearer than Europe, it is highly probable that our fleet would be first to return to the firing line. This would mean three-fourths of our strength with which to attack one-half the enemy's, and with such an engagement on it would not be difficult for the remaining fourth to render assistance.

I believe, however, that after an engagement in American waters no naval power in the world would be in a condition to proceed with the bottling up or destruction of any part of our force without first seeking repairs or coal. If this be true, it is really a problem of "coming back" and the one that can come the swiftest and surest has all the advantage.

The above is not intended as an argument for retaining our useless navy yards. There can be no doubt that a number of our smaller yards are useless and should be abandoned, as they would serve no more useful purpose in war time than they do in peace time. Neither is this a plea for any particular yard or number of yards, but rather is it intended to point out the possible danger of too great a consolidation, based on consideration of industrial economy.

When we consider then that the economic industrial advantages of consolidation are much diminished, perhaps made negative by the necessity for military defence, and that the necessity for military expedition in war times outweigh all considerations of economy in peace times, and the possibility of losing our entire navy yard strength by the fall of a single stronghold or two, we must be convinced that the principle of consolidation on the ground of economy is short-sighted and disastrous.

I would enter a strong plea for the principle of distribution as opposed to consolidation in this instance. New York, Philadelphia, Norfolk and Boston each have a well established navy yard, amply protected by the defences of the city. To abandon any one of these is an evident weakening of our naval strength. Let the number of navy yards be decided upon military considerations, based on the number of units in which our fleet would naturally divide for emergency repairs, and having fixed the number, then proceed to make them as nearly equal as possible by a proper proportioning of the manufacturing and repair work in peace times, carrying it even so far as to distribute the shipbuilding among the different yards, so far as facilities established by military considerations will permit.

One large navy yard rushed with work and three small ones slack of work is an unbalanced condition of affairs, just as a fleet would be composed of one big, powerful, speedy ship and three smaller, weaker, and slower ones.

DISTRIBUTION OF WORK TO OUR NAVY YARDS.

It is the general policy of individuals and business houses to buy where they can buy the cheapest. Some are wise enough to consider the quality as well as the price and buy where they can buy the cheapest, consistent with the desired quality, or, better still, the *necessary* quality. Others, whose tastes are extravagant and means plentiful, insist upon paying a fancy price, firm in the belief that the highest-priced article is always the best. And in honest business it should be so, and, efficiencies and profits being equal, it *is* so. But the quality may be higher than necessary and the high price paid unwarranted by the conditions under which the purchase is made. There can be no doubt that the correct policy for the government, as well as for individuals, is to buy the article of *necessary* quality at the lowest obtainable price, provided the only consideration is the economic purchase of the article. It may develop, however, in certain lines of the government's business, that other considerations than the economic purchase of an article enter into the problem of obtaining it. This is true of such articles as are manufactured in our navy yards and of such work as is done there.

The government is here both consumer and producer. As consumer. it is interested primarily in the cost of the article; as

producer, it is interested primarily in the efficiency of the plant. I desire to point out the relative importance of (1) the cost of the article; and (2) the efficiency of the plant; and to demonstrate that the purpose of our navy yards being the economic maintenance and expeditious repair of our fleet in peace and war times, the question of increased efficiency in the accomplishment of this purpose is of such vast importance that the low cost of any particular article is of relatively minor importance; that in distributing work we should consider the effect of such distribution on the general efficiency of our navy yards rather than the low cost of the work.

Work is to the navy yard what ammunition is to the fleet; it is the instrument by which the yard is trained to higher efficiency. It is just as important that the navy yard should have a uniform allotment of work suited to its equipment as it is that the fleet should have a uniform allowance of ammunition suited to its guns.

Let us remember that certain navy yards are forced upon us by military considerations. These navy yards must be sufficient in number and capacity to handle our war fleet quickly in the event of an emergency, and in order that each yard may handle its share of the ship repairs it is necessary that all yards be fully equipped for performing all classes of work; that is, each must have a fully equipped joiner shop, shipfitter shop, smith shop, machine shop, foundry, pattern shop, etc. In order that the yards may perform efficiently the function for which they are primarily designed and maintained, it is necessary that they be kept operating in all lines of work for which they are fitted at as great a capacity as the normal work required for the maintenance of our fleet will permit. In order that the machines may be maintained in efficient condition, it is necessary that they be kept in operation. In order that they may be operated efficiently it is necessary that there be enough work for them to permit of the training of men for their operation; and in order that such trained men may be on hand when required we must offer them reasonably steady employment so that they may be induced to work in our navy yards and maintain their homes in the vicinity. It can well be imagined that a fully equipped navy yard might fail to perform its function at a critical time by reason of the unused, inactive condition of the machines, or the lack of competent operators to run them. At such a critical time, competent operators are necessary,

not only for obtaining low costs of production but also for expediting the urgent work that is at hand. Efficiency of the plant and of the workmen means, therefore, not only low costs but expedition.

So it appears that the practice of awarding particular classes of work to particular navy yards on the basis of the lowest bid may be in error and may lead to very low total efficiency and to an utter failure at a critical time.

In our present state of organization, the practice may be objected to for the reason that many of our estimates are quite unreliable, being made by foremen or others who realize that the work will be awarded on the basis of the lowest estimate and who therefore reduce their estimates below their warranted amount, for the purpose of obtaining such work. This is not stated to be the practice, but is stated as a possibility under the present conditions. If awards are to be made on the competitive basis they should not be made from a comparison of bids, but rather from a comparison of returned costs obtained from different yards where an equal amount of the same class of work has been performed in accordance with standard specifications and with full knowledge that the cost of such work will furnish the basis for its award in the future. Such a practice might be considered as truly competitive, in that it would give all yards an opportunity to devote their attention to increasing the efficiency of the particular manufacturing operation involved, and would stimulate the officials and the workmen, as competition along any line usually does.

It may develop, however, that the attention devoted to the particular article or operation for the purpose of reducing its cost will result in a lack of attention to some very much more important article, or operation on which there is no competition, and that to place the yards on a competitive basis will not result in increasing the efficiency in the broad, general sense that is desired; and I wish to invite attention to an alternative method of awarding the work that will perhaps result in a higher average efficiency.

As pointed out above, we are obliged to maintain a certain number of navy yards of a certain capacity. Suppose then that we assign to each of these yards a figure for each class of work, which shall represent the normal capacity of that yard for that class of work. A number of different ways might be suggested for obtaining this figure.

(1) It might be on the basis of the number of ships normally assigned to that yard for repair;

(2) It might be on the basis of the number of ships that would probably be assigned to that yard for repair in the event of an emergency, such as war;

(3) It might be on the basis of capital invested in such plants.

(I do not intend to go into a discussion of which of the methods of determining this figure is the best; but it may be mentioned that as the yards are designed for emergency rather than normal conditions, they are nearly equal as regards the capacity of their plants or the capital invested in such plants, and that a more reasonable figure would probably be obtained by considering the normal amount or the emergency amount of work assigned to various yards.)

Having determined such a figure, work would then be assigned to that yard which required it for the maintenance of its normal working force, each yard receiving its proportion of the work according to its assigned figure.

Suppose, for instance, that the canvas work to be allotted for any particular period were represented by 1000 hammocks, and that the figure for the New York, Norfolk, Philadelphia, Boston, and Portsmouth yards were respectively, 10, 9, 8, 7, and 6; then New York would receive 10/40, or 250 hammocks; Norfolk, 9/40, or 225 hammocks; Philadelphia, 8/40, or 200 hammocks; Boston, 7/40, or 175 hammocks; and Portsmouth, 6/40, or 150 hammocks. Having assigned the work in this proportion, the competitive feature, which stimulates individuals and organizations toward efficiency, might be obtained by publishing a bulletin or letter which detailed the allotments of work, and when the work had been completed, publishing a second bulletin or letter in which the costs of the hammocks at the various yards would be given, which comparison would be on the basis of direct labor, since this is the true basis of comparison. Each yard would thus have brought to its attention, in comparison with other yards, the output of hammocks per man per day, and if any yard continued to be inefficient in some particular line it could be directed to investigate and determine why its output was below that of other yards. The least efficient yard would thus be given an opportunity to attain the standard of the most efficient. This appears to be more truly competitive in effect than the system of awarding all

the work to the one yard offering the lowest bid, since the latter system really stifles rather than promotes competition; for a yard having bid somewhat high on an article is given no opportunity to increase its efficiency, but is cut off from all work of that nature by reason of the total award having been made to the lowest bidder. Thus, it may develop that yard No. 1 would make a higher bid for hammocks than would yard No. 2. These hammocks having been awarded to yard No. 2, the sail-loft work in yard No. 1 would be greatly reduced, which reduction in work would result in a reduction in force, which reduction in force would lead to a lower efficiency in the matter of performing the work yet remaining in that yard. We will say, then, that yard No. 1 still has an order for hospital tents. A short time later bids are called for on hospital tents. Yard No. 2 has been running its sail-loft to capacity by reason of its recent success in obtaining the order for hammocks, and is, therefore, in a more active and more efficient condition than yard No. 1. Yard No. 2 is again the lowest bidder and is awarded the contract for hospital tents, which again results in higher efficiency for that yard and a lower efficiency for yard No. 1. If carried to the limit, this means that yard No. 1 will be driven out of the sail-loft business, and the canvas work will be concentrated in one particular yard. We have thus attained efficiency in canvas work at that particular yard, but to do so have sacrificed all the other yards, and there is no longer any competition; yet we must maintain a sail-loft at each of those other yards in order that repairs may be made to the ships assigned to them; but when the ships leave the yard they take their work with them and we have no work with which to maintain our force. The men are discharged, seek employment elsewhere, and eventually leave the vicinity.

If work is distributed to various navy yards with a view to providing a uniform amount for each so as to maintain a fairly steady working force in the various trades, based on the normal capacity of the yard, it will result in adding to the positions the inducement of steady work, which appeals to the right class of men, and it will thus be possible to keep men steadily in the employ of the government and train them to the particular work for which they are adapted. One of the most serious considerations in the employment of labor at navy yards is the lack of *steady* work, causing abnormal fluctuations in the size of the force, and discourag-

ing men who are desirable, since they work constantly with the fear of discharge hanging over them and are quite ready to accept positions at private establishments when opportunity offers. If it can be brought about that each navy yard can be assured a certain reasonable quantity of work and thus enabled to maintain its normal force steadily, it will result in a great increase in the efficiency of all work done; and the gain to the government will undoubtedly be greater than is the gain attained from awarding work on the basis of competitive bids.

It is the competitive bid principle which has so successfully eliminated the small plants and dealers from the industrial world and promoted the growth of corporations and monopolies, since it is a well-known fact that large companies are in the habit of bidding lower than production costs would warrant for certain business on which they have to compete with similar or more special establishments. They are willing to lose money where they have competition and to make it up where they have a monopoly. While the consumer has probably profited up to the present time and been able to obtain certain articles cheaper than formerly, in the end the average price paid for all commodities will be higher than would be the case were monopolies not made possible.

This is not exactly analogous to the situation of our navy yards, but suggests one of the dangers of over-competition, namely, the elimination of the unsuccessful bidder. We have established our navy yards for military reasons, and for military reasons cannot afford to eliminate them. If it is admitted that we must maintain our navy yards in a condition to carry on all classes of work, then surely it will be admitted that they will all be kept in a healthier, more active and more efficient state if each is furnished with a sufficient amount of the various classes of work to keep its normal force busy. In order that this may be done, the manufacturing work must be allotted to the various yards in such manner as to furnish them employment in the absence of repair work.

Lieutenant-Commander Lyman A. Cotton, U. S. N., in an article in the PROCEEDINGS OF THE U. S. NAVAL INSTITUTE, on "Competition *vs.* Character" has pointed out some of the dangers of competition as applied to our service. A portion of this essay is quoted herewith:

> Competition is unquestionably a stimulant, and avowedly so administered to our Service but it is feared that we are actually trying to keep our

quondam patient alive by this stimulant. Louder and more insistent grows the cry for more and still more competition and more and more neglected are the non-competitive features that enter into naval efficiency, until their very importance is forgotten and their utility denied. . . . . In the branch of gunnery, competition has reached its most violent development. As the time for target practice approaches, interest in the competition (not necessarily in gunnery) increases until all else is lost sight of in the one possessing idea of standing well. As our competition is conducted and emphasized, the desire to win is inordinately stimulated alike by the vanity of the officers and the cupidity of the men, until in many cases it becomes such a passion that erstwhile good judgment is so warped that prudence and discretion are thrown to the winds. Small wonder that competition and accident have so frequently gone hand in hand. As soon as the practice is over the artificially stimulated interest collapses like a punctured balloon and the art of gunnery languishes until the approach of the next gunnery practice.

However, some of the bad results of too violent competition follow close upon the heels of target practice. Insinuations, jealousies, disputes, and protests are belched forth *ad nauseam*. . . . . The enlisted personnel of our Service is in a constant state of change, and is replenished largely by young, impressionable, and untrained men, and to a lesser degree the same is true of the commissioned personnel. These young men receive their most vivid impressions of the Service through the competitions in which they take part. All stress is laid upon these competitions purely as competition and everything else is relegated to the background of unimportance. Every appeal is made to vanity and cupidity, the twin foci of the ellipse of competition about which, as centers, so many of the evils of competition revolve. It is not surprising that one who does well in competition magnifies his own importance out of all proportion to the true case. He puffs himself up, much as does the star player upon some minor college team, until the very success of the team is held in his hand and subject to his very caprice. He holds himself to be superior to his fellows and not subject to ordinary rules and regulations. The indispensable man should not be tolerated aboard ship, and a man, though qualified through competition, may thereby be ruined as a military asset.

Restrain and control competition. Make it serve as a means instead of an end. Do not sacrifice anything important to competition. Keep down artificiality. Do not attempt to grade all competitors with exactitude. If a ship be excellent in gunnery or very good in steam engineering, it is quite enough that she know this, without attempting through some more or less artificial standard to express just how excellent she is or just where she comes among all those that are very good. Allow all the crew of an excellent ship to wear some badge of honor, as an "E" upon their sleeves or a colored cap ribbon, but do not attempt to buy war efficiency with dollars and cents.

It is perfectly conceivable that in encouraging competition along certain lines at our navy yards, the officers and foremen would devote their time to "making good" and sacrifice con-

siderations of general efficiency to considerations of obtaining the award of certain classes of work. At the present time we are in need of a broad, general improvement in efficiency rather than improvement in the efficiency of some particular operation, and our energies should be directed toward an improvement in our organization and general methods.

The mistake is sometimes made of thinking that competition has some value other than a stimulating effect. Competition does nothing more than direct our energies toward some particular matter which shows up unfavorably in comparison with the same matter at other yards. Thus it may develop that through competitive bids we learn that yard No. 1 is able to manufacture furniture cheaper than yard No. 2. Such information merely suggests to yard No. 2 that the manner of manufacturing furniture requires attention but it does not suggest in any way the manner in which yard No. 2 can improve its efficiency. In order to arrive at the improvements necessary, yard No. 2 must investigate thoroughly the various operations of manufacturing, then proceed to their improvement. The same result could have been obtained without competitive bids, since such are not necessary to direct the energies of those in charge of navy yards toward the improvement of conditions; for if we have the knowledge or belief that conditions are good or bad, we can readily determine for ourselves by a process of investigation leading to improvement, and when conditions have been improved and standardized the use of the time-study to get at the efficiency of the men can be undertaken.

The mistake is sometimes made of considering efficiency only as a relative quantity; that is, the efficiency of one yard is compared with that of another. Figures obtained in such a manner may be misleading, and it is much more valuable to consider efficiency as an absolute quantity, having a maximum represented by 100%. By a study of the operations it is determined that some losses are due to conditions, some due to methods, some due to incompetency; all of which lower our efficiency. These losses can easily be assigned an absolute value, and their elimination increases our efficiency to that extent.

Competition as applied to our navy yards should consist in a comparison of the costs of various classes of work at the different yards, but should not extend to the awarding of contracts on the

basis of competitive bids. Such a process, if carried to the end, eliminates competition entirely by concentrating particular work in one yard. This is prohibited by military considerations and should therefore not be encouraged by any system opposed to it. The problem is to make all of our navy yards as efficient as possible in the classes of work which they are called upon to do. A one per cent improvement in the general efficiency represents a greater absolute gain to the government than a ten per cent increase in efficiency in some particular operation.

The above outlined policy should not be considered as forbidding the concentration of the manufacture of a particular article in one navy yard, provided you allot similar work to other yards in the proportion necessary to maintain their normal working force in that line. It should be noted, however, that as soon as you confine any class of work to one navy yard you no longer have competition, so that the advocates of competitive awards will quite naturally work themselves out of material for carrying out their policy.

The arguments in favor of a properly proportioned distribution apply more strongly to work of a military nature than to work of a non-military nature. For example, in the event of an emergency it may be of no importance that we have been left without an efficient sail-loft, but it would be of great importance if we were left without an efficient and adequate shipfitters' shop, smith shop, or machine shop. While the military work in times of emergency will be mostly repair work, yet it must be borne in mind that a repair job, when analyzed, is for the most part made up of standard manufacturing operations, and it is the manufacturing work in quiet times which enables us to tone up the shop required to do repair work in an emergency, for upon the manufacturing job we have time to plan and study and to develop certain standard conditions, methods and outputs, which will apply alike to the manufacturing operations of repair jobs, increasing their efficiency of performance, both as regards cost and expedition. For example, the training given a lay-out gang, a punch-and-shearing gang, a riveting gang, the move-man, the various functional foremen in a shipfitter's shop in the manufacture of a tank, signal locker, bread locker, or other like article, properly planned and routed, will effect surprising economies in the time and cost of getting out the structural work necessary to

repair damage to a ship of a military character. The training given the management and men in handling one job properly is felt in increased efficiency in the handling of all jobs that follow. It is an improved tone, a broad, general increase in efficiency that we are after.

(The arguments advanced above might be applied to the broader, more important and general problem of the relative size and number of our navy yards. While it might be an economic policy to increase the size of one navy yard at the expense of the others, by concentrating work there, yet it might have a disastrous policy in the stress of war should that navy yard be taken or destroyed. It is better, therefore, to fix upon a certain number of navy yards necessary for military reasons and then to try to make them as nearly equal as possible by a proper proportioning of the manufacturing and repair work in peace times, carrying it even so far as to distribute the ship-building among the different yards, so far as facilities established by military considerations will permit. One large navy yard rushed with work and three small ones slack of work is an unbalanced condition of affairs, just as a fleet would be composed of one big, powerful, speedy ship, and three smaller, weaker, and slower ones.)

In the above paper, it is intended merely to suggest that in the establishing of our navy yards and the allotment of work to them, their purpose and reason for existence should be borne in mind, and small gains and economies should not blind us to the broad, general efficiency that should be the first aim. The problem is not how and where to get a ditty box the cheapest, but how and where to maintain our fleet the cheapest. Anything which lowers the general industrial efficiency of our navy yards is a poor military policy.

It is no more logical to award the work to our navy yards on the competitive basis than to award the allowance of ammunition to our ships on the basis of which made the most hits at the last target practice. Suppose we should say: "The ship that makes the most hits this year will do *all* the firing next year. The shop that does the cheapest work this year will do *all* the work next year."

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

OUR NATIONAL FLAG.

A SHORT HISTORY OF ITS DEVELOPMENT. ITS LACK OF UNIFORMITY IN GOVERNMENT DISPLAYS. SENTIMENT OR SENTIMENTALITY IN ITS USE.

By CAPTAIN W. F. HALSEY, U. S. Navy.

Having for a number of years among other duties that of the issue to vessels of the service of flags and jacks of standard dimensions it was found most instructive and interesting to note the changes and development of the flag from the time when proportions were established by the naval commissioners in 1818 until the present date. Congress on returning to the original thirteen stripes from the existing fifteen stripes passed an act, that was approved April 4, 1818, which read as follows:

AN ACT TO ESTABLISH THE FLAG OF THE UNITED STATES.

SEC. 1. Be it enacted etc. That from and after the fourth day of July next, the flag of the United States be thirteen horizontal stripes, alternate red and white; that the union have twenty stars, white in a blue field.

SECT. 2. And be it further enacted, That on the admission of every new State into the Union, one star be added to the union of the flag, and that such addition shall take effect on the fourth of July next succeeding such admission.

While the color and number of the stripes were legalized, together with the color and number of stars in the field, there was no law passed or details given as to arrangement of stars, sizes of field, or relative dimension of a standard flag. Apparently these important points were overlooked, but for the navy were covered by the following circular:

NAVY COMMISSIONERS OFFICE, MAY 18, 1818.

SIR,—The Navy Commissioners have to inform you that agreeably to the Act of Congress on the 4th of April 1818, entitled *An Act to Establish the flag of the United States*, our national flag is, and from after the the 4th of July next, to be: Thirteen horizontal stripes, alternate red, and white. The union to be twenty stars, white in a blue field, one star to be added on the admission into the Union of every new State; such addition to be made from and after the 4th of July next, succeeding the date of such admission.

The size of the flag must be in the proportion of fourteen feet in width and twenty four feet in length, the field of the union must be one third the length of the flag, and seven thirteenths of its depth, so that from the top to the bottom of the union there will be seven stripes, and six stripes from the bottom of the union to the bottom of the flag. The manner of arranging the stars you will perceive by the subjoined sketch.

The upper and lower stripes to be red.

Respectfully,

(Signed) JNO. RODGERS, President.

The Officer Commanding, The Navy Yard, Portsmouth, N. H.

In the sketch to which reference is made the twenty stars were arranged in four parallel lines, five stars in each line, the stars being staggered. On September 18, 1818, a second circular was issued changing the arrangement of the stars so they appeared in four parallel lines, of five stars each, the corresponding stars in each row arranged in a vertical line. The latter arrangement has practically obtained in order to have the necessary space. With the admission of new states, and consequent addition of stars, it became desirable on the score of symmetry to make certain changes in relative proportions of the flag. The first systematic and definite official orders on this subject were probably issued by Mr. Chandler as Secretary of the Navy in 1882, and appear in the allowance book of articles under the cognizance of the Bureau of Navigation, which bureau was at that time charged with the issue of all flags to the naval service. In this allowance book the size of the union was increased from one-third to four-tenths the length of the fly, and the width (hoist of flag) was changed to 10/19 the length of the fly. Eight standard sizes were adopted, numbered respectively from one to eight, number one the largest with a hoist of 19 feet, and a fly of 36 feet, number eight the smallest boat flag being 2.37 feet by 4.5 feet.

Subsequently to this date the manufacture of all flags was transferred to the Bureau of Equipment, and on September 30, 1891, Admiral George Dewey, then Chief of Bureau of Equipment, directed further detailed standardizing of naval national flags, and added an additional number ten boat flag, to be attached to the sails of boats when maneuvering or drilling under such conditions. To preserve the identity of the stars in the flags and unions it was necessary that they should be of moderately large dimensions, and with a view to obtaining uniformity in the sizes of the stars and their position in the union certain dimensions were adopted, also a method applicable to all sized flags by means of which the position

of the center of each star could be absolutely obtained. For flags below number five storm (hoist 5.14 feet, fly 9.75 feet) the unions were to contain only thirteen stars. These dimensions and arrangements have continued in the naval service practically to this date, save only the additional stars necessitated by the admission of new states. For union jacks the sizes were automatically obtained from given dimensions of the national flags. The jack formed one of a pair of colors and was designated by number. That is number one jack was flown with number one flag, or number five jack with number five flag, and the dimensions of such jacks were those of the respective unions of the flag with which they were paired.

In recent years the arrangement of stars due to change on admission of new states was referred to a joint army and navy board. This board submitted plans and recommendations which, upon being approved by the President, were issued to the military services by the respective heads of these departments, in general orders. Though such orders have the force of law for these services the fact still remains the same that there is no law of the land enacted by Congress which makes mandatory the arrangement of the stars, or the number of stripes below the union, for the national flag of our country.

Previous to 1866 our flags had been manufactured generally from English bunting, as no domestic texture had been found capable of resisting efficiently the wind and action of the atmosphere. On February 21, 1866, the Honorable B. F. Butler, of Massachusetts, introduced to the Senate the agent of the United States Bunting Company, of Lowell, Massachusetts, who presented to them for the use of the Senate a flag manufactured by the company from bunting of their domestic production. This flag was twelve feet hoist by twenty-one feet fly, and is believed to be the first real American flag ever raised over the Capitol of the United States. A test ordered by the Navy Department proved the American bunting to be of the best quality and fast in colors. Since this date it is required by the military services that all national flags shall be made of domestic bunting, unless impossible to obtain within the United States bunting that shall meet the required specifications. Though the navy specifications are most severe as to weight, wool, tensile strength, number of yarns of which woven, color tests, and sun exposure, no trouble has been experienced in obtaining the desired fabric for the national flag. Flags for the navy are manufactured at the New York, Mare Island and Cavite navy yards,

strictly in accordance with specifications and drawings, and necessary supplies of this equipment are drawn from the yards by vessels of the Atlantic, Pacific and Asiatic fleets. Up-to-date methods of manufacture are followed, with star cutting machines and motor driven sewing machines, and such manufacture offers employment for skilled employees of both sexes. Flags for the army are manufactured at the Schuylkill Arsenal, Philadelphia, where an extensive plant for this purpose is maintained.

While the navy has found by experience the necessity for nine sizes of flags, with changes from the original proportions, the army has been for general service use restricted to post, garrison and storm flags (three sizes only), and in these flags have the uniform length of the union, one-third that of the total fly of the flag, but the dimensions for the fly do not bear the same relative proportions in any two flags. For both services an exception is made in relative proportions in the flag carried by troops, as such flags carried on a pole by the standard bearer were found by experience to require a shortening of the fly to be handled properly by the average man.

Since the establishment of system and economy in administration flags for all government departments, except State, War and Navy, are purchased by the General Supply Committee, which committee as its name indicates is charged with duty of obtaining, with exceptions, the general equipment and items for government use.

The attention of the Secretary of the Navy was called to the fact that there was no standard for our national flag, that while different service would require different sizes, all such sizes should conform in relative proportions. As now existed the army had three sizes, no two of which had the same relative proportions regarding hoist and fly, that the navy had nine sizes of flags, all of which bore the same relative proportions in dimensions, but that the size of the union as adopted for the navy differed from that existing for army flags. Furthermore it was pointed out that for the other departments of the government, the General Supply Committee had contracted for or had issued schedules including flags of over fifty different sizes, in which sizes were radical departures from proportions of either military service.

The head of the Navy Department referred for consideration to each of the other governmental departments the desirability of appointing a representative to confer with the other representatives with a view to reconciling existing differences, and to decide upon

and recommend a standard for the national flag and union jack, to which all flags should conform in relative proportions. It is understood that the suggestion of Mr. Meyer was received with universal approval by the cabinet officers, and that a board consisting of nine representatives has met and submitted a report on this subject.

From all information obtainable it becomes patent that the United States Navy is the only military service that denies to its personnel the honor of being covered by the national flag when buried. The naval regulations are mandatory on this subject and state that the coffin of any officer or enlisted man of whatever rank shall be covered by the union jack. In the sister service, the army, the coffins of their personnel, from general to private, are covered on occasions of military funerals by the stars and stripes. Why the distinction? So far as can be learned it is due to a misunderstanding that crept in early regulations and which misunderstanding has been perpetuated in subsequent issues of the *Blue Book*. Tradition and records point to the fact that in the early publications of naval regulations the requirements of the English service were followed; requirements which generally were most excellent and equally applicable to the infant navy of our country. The English naval regulations indicate that at military funerals the coffin shall be covered by the union jack, and this it is believed is the source from which sprung the custom followed in our navy. But the individual, officer or civilian, who originally copied from the regulations of our cousins across the sea, failed to recognize the fact that the union jack is the national flag of England or now the national flag of the British Empire. On pages 5, 17, and 19, of the British Admiralty publication, *Flags of All Nations*, issued by the Admiralty as official in 1907, will be found the following statements: "National or Union Flag. Established in 1606 by King James the 1st, when the union was made of the banner of St. George of England, and St. Andrew of Scotland, amended by order of the Queen in Council, on April 17, 1707, on report of the Lords of the Privy Council. The present Union Flag of England was completed on Nov. 5, 1800, approved by the King, and the cross of St. Patrick was conjoined to that of the crosses of St. George and St. Andrew."

The publication quoted is authority for the following statement: "It is believed that the term *Jack* is derived from the abbreviated name of the reigning Sovereign King James the 1st, under whose

direction the flag was constructed, and who signed his name *Jacques."*

Thus the union jack of Old England is the national flag. It is carried by the troops, fought under when occasion requires, is hoisted on all forts and army stations and by all English diplomats and consular authorities, the particular rank being noted by specific badge placed thereon as required by regulations. The so-called union jack of the United States has no legal existence, no statute authorizes its manufacture or describes its use or details. It is a signal flag pure and simple, and through mistaken usage has apparently established the precedent for such flag, neither sentiment nor sentimentality can in any way support the contention that such is a national flag.

The caskets containing the dead recovered from the wreck of the *Maine* were on the occasion of the final obsequies in Washington covered, as the navy regulations require, by jacks. In Havana these same caskets reverently guarded and carried by Cubans were covered with the national flag.

Within a year in the city of Washington have taken place the funerals of two naval veterans, who served under their flag in two wars. Each veteran had reached the grade of rear-admiral. On each occasion the Navy Department recognizing the services rendered by these officers honored their memories by ordering the brigade of midshipmen from Annapolis to form the right of the military escort. The casket of one admiral was draped, as required by regulations, with the union jack. The covering of the casket of the other was the national flag that had been flown during the naval engagement of Santiago by the vessels this officer had commanded on that occasion. The one, a new jack, without service or association, the other a national flag, beloved by both, shell torn and powder smoked, in itself endowed with living attributes of the life to which both veterans had devoted their best hours, days and years. Sentiment, or sentimentality; which draping appeals most to the world, which draping was the one appropriate for the historical dead?

Custom of the service is not without its uses, but such custom when founded on mistaken premises should not exist. The national flag is permitted to be flown over the individual during life time, and offers the protection of the well beloved country; is it not fitting that when taps are sounded for a life ended in the service that the last honors paid should be under the national flag?

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE LE DUC BALLISTIC FORMULÆ.

By G. W. PATTERSON.

The use of these formulæ, in the form given by Professor Alger in the NAVAL INSTITUTE PROCEEDINGS, Vol. 37, No. 2, Whole No. 138, has been limited to pressure calculations, and to fixing charges for low velocities when the charge for a higher velocity in the same gun was known.

As stated by Alger, they failed entirely when used to predict the performance of a powder in one gun from results obtained by firing the same powder in a gun of different caliber. As it was evident that this failure was due to the empirical values given the constants in the formulæ, it was decided to determine these values from actual data on the proving ground.

Starting with the basic formulæ:

$$v = \frac{au}{b+u},$$

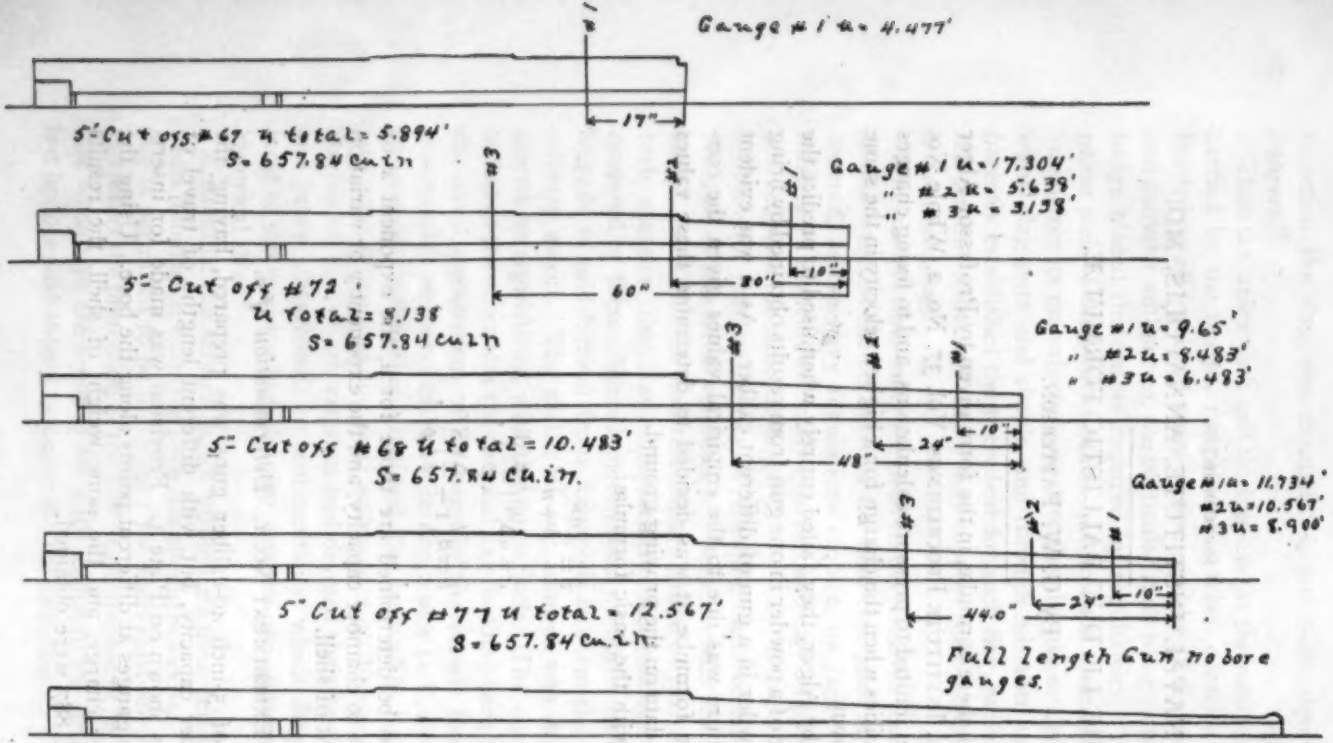
$$a = \alpha\Delta^{\frac{1}{3}}\left(\frac{\overline{w}}{p}\right)^{\frac{1}{3}},$$

$$b = \beta\left(1-\frac{\Delta}{\delta}\right)\frac{S^x}{p^y},$$

the values to be determined are those for α, the exponent x or variation due to chamber capacity, and the exponent y or variation due to weight of shell.

EXPERIMENT NO. 1. *Determination of* α.

A series of 5-inch 40-caliber guns was prepared, having the same chamber capacity, but with different lengths of travel of projectile, as shown on Plate 1. Provision was made for inserting pressure gauges at different points along the bore. Using the same powder charge, and the same weight of shell, the results shown on p. 887 were obtained.



J. S. Snelden
Lieut-Comdr. U.S.N. Inspector in Charge

Supersedes No-675

M P & Dwg
700 5-25-12
Scale 1/2 - 1'

PLATE I.—5 40-CAL. CUT-OFF GUNS: GUN NO. 68, MK. II, MOD. 4; NO. 67, MK. II, MOD. 4; NO. 72, MK. IV; NO. 77, MK. IV.
SHOWING POSITION OF BORE GAUGES FROM ACTUAL MEASUREMENTS AT INSPECTOR ORDNANCE WORK, BUFFALO, N.Y.

	Charge	Muzzle velocity, f. s.	Maximum pressure, tons
Gun No. 127	8.8	2204	14.27
Gun No. 127	8.8	2204	14.67
Gun No. 127	8.8	2204	14.40
Gun No. 77	8.8	2162	14.16
Gun No. 77	8.8	2162	15.3
Gun No. 77	8.8	2162	13.81
Gun No. 68	8.8	2089	15.16
Gun No. 68	8.8	2089	15.51
Gun No. 68	8.8	2089	15.09
Gun No. 68	8.8	2089	14.88
Gun No. 72	8.8	1969	13.48
Gun No. 72	8.8	1964	13.55
Gun No. 72	8.8	1969	13.74
Gun No. 72	8.8	1969	14.39
Gun No. 67	8.8	1821	14.16
Gun No. 67	8.8	1821	14.11
Gun No. 67	8.8	1821	14.25

The results obtained in bore pressure gauges are plotted on Plate 2. From the basic formulæ we find by elimination:

$$a = \frac{vv'}{\Delta^{\frac{1}{3}}\left(\frac{\varpi}{p}\right)^{\frac{1}{3}}} \cdot \frac{(u-u')}{(v'u-vu')}.$$

From the above results, $a = \begin{cases} 6820 \text{ for No. } 77, \\ 6816 \text{ for No. } 68, \\ 6834 \text{ for No. } 72, \\ 6733 \text{ for No. } 67. \end{cases}$

As little hope had been entertained of obtaining good results with the shortest gun, the fourth result was discarded and the average value 6823 was adopted for use in future work.

EXPERIMENT No. 2. *Determination of exponent x, variation due to chamber capacity.*

Using a fixed powder charge and the same weight of shell, rounds were fired in the 4-inch 40-Mk. VI and 4-inch 50-Mk. VII guns as follows:

	Charge, lbs.	Muzzle velocity, f. s.	Maximum pressure, tons
4-inch 40-Mk. VI	5.5	2125	13.2
4-inch 40-Mk. VI	5.5	2125	13.34
4-inch 40-Mk. VI	5.5	2125	13.15
4-inch 50-Mk. VII	5.5	1846	6.87
4-inch 50-Mk. VII	5.5	1846	7.07
4-inch 50-Mk. VII	5.5	1846	7.08

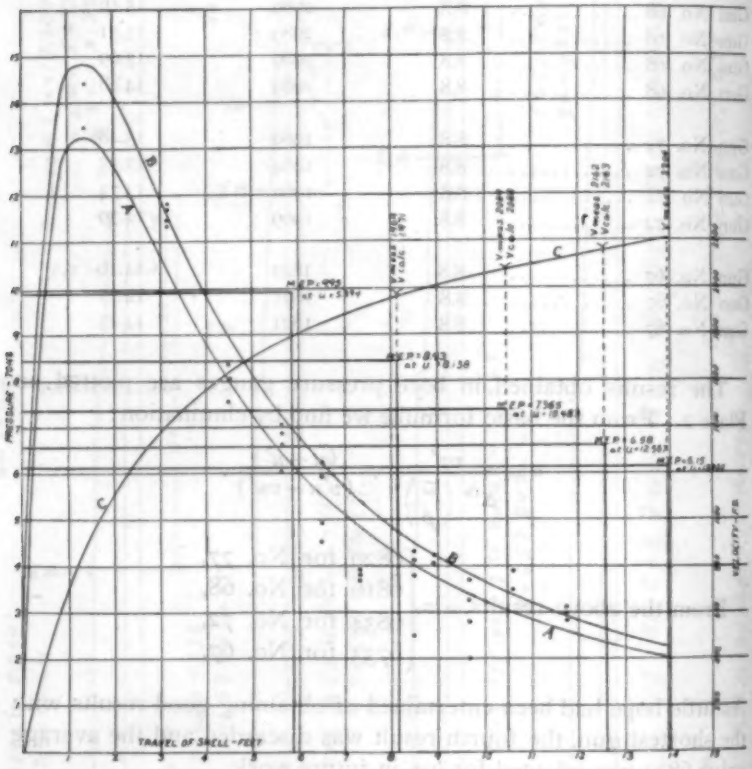


PLATE 2.—5-INCH 40-CAL. CUT-OFF GUN EXPERIMENT. DEC. 8, 1911.

From the basic formulæ we find:

$$\left(\frac{S'}{S}\right)^x = \frac{(a'-v')u'v}{(a-v)uv'} \cdot \frac{(\delta-\Delta)}{(\delta-\Delta')}.$$

From the above results, $x=.674$ and the value used for the formula is $\frac{2}{3}$.

EXPERIMENT NO. 3. *Determination of exponent y or variation due to weight of shell.*

Shell of the same type but of different weights were fired in the 5-inch 50-Mk. VI-1 gun, using a constant powder charge, with results as follows:

Charge, lbs.	Wt. of shells, lbs.	Muzzle veloc., f. s.	Max. pressure, tons
14	50	2437	9.77
14	50	2437	9.77
14	50	2437	9.77
14	50	2437	9.77
14	60	2291	10.61
14	60	2291	10.68
14	60	2291	10.47

From the basic formulæ we find:

$$\left(\frac{p}{p'}\right)^y = \frac{(a'-v')v}{(a-v)v'}.$$

From the above results, $y=.646$ and the value $\frac{2}{3}$ was adopted. With the values found, we have for working formulæ:

$$v=\frac{au}{b+u},$$

$$a=6823\Delta^{\frac{1}{15}}\left(\frac{\bar{\omega}}{p}\right)^{\frac{1}{2}},$$

$$b=\beta\left(1-\frac{\Delta}{\delta}\right)\left(\frac{S}{p}\right)^{\frac{1}{2}},$$

$$P=\frac{a^2bpu}{2240gA(b+u)^3},$$

in all of which:

$\bar{\omega}$ = weight of smokeless powder in pounds.
p = weight of projectile in pounds.
Δ = density of loading.
S = chamber capacity in cubic inches.
β = a powder constant.
v = muzzle velocity in f. s.
u = travel of projectile in feet.
A = cross-section of the bore in square inches.
g = acceleration of gravity in f. s.
δ = density of powder. In navy powder this varies practically with the quantity of total volatiles and is shown graphically on Plate 3.
P = effective pressure on base of shell in tons per square inch at any point u in travel of shell.

Plate 2 shows curve *A*, the effective pressure on the base of the shell computed from the velocity obtained in the long gun; curve *B*, the estimated pressure on the gun computed by adding 12 per cent to the pressure on the shell; curve *C*, the velocity curve calculated from the velocity found in the long gun, and the plotted velocities obtained in firing the cut-off guns; the mean effective pressure on the shell computed from the muzzle velocity of each gun; the plotted points of pressure by gauges in all guns.

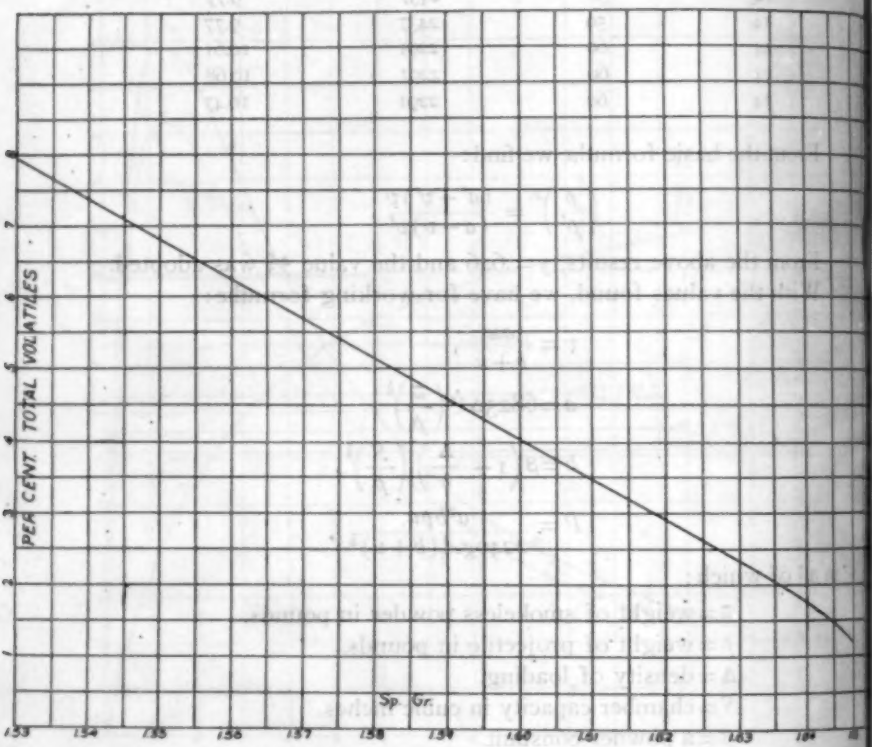
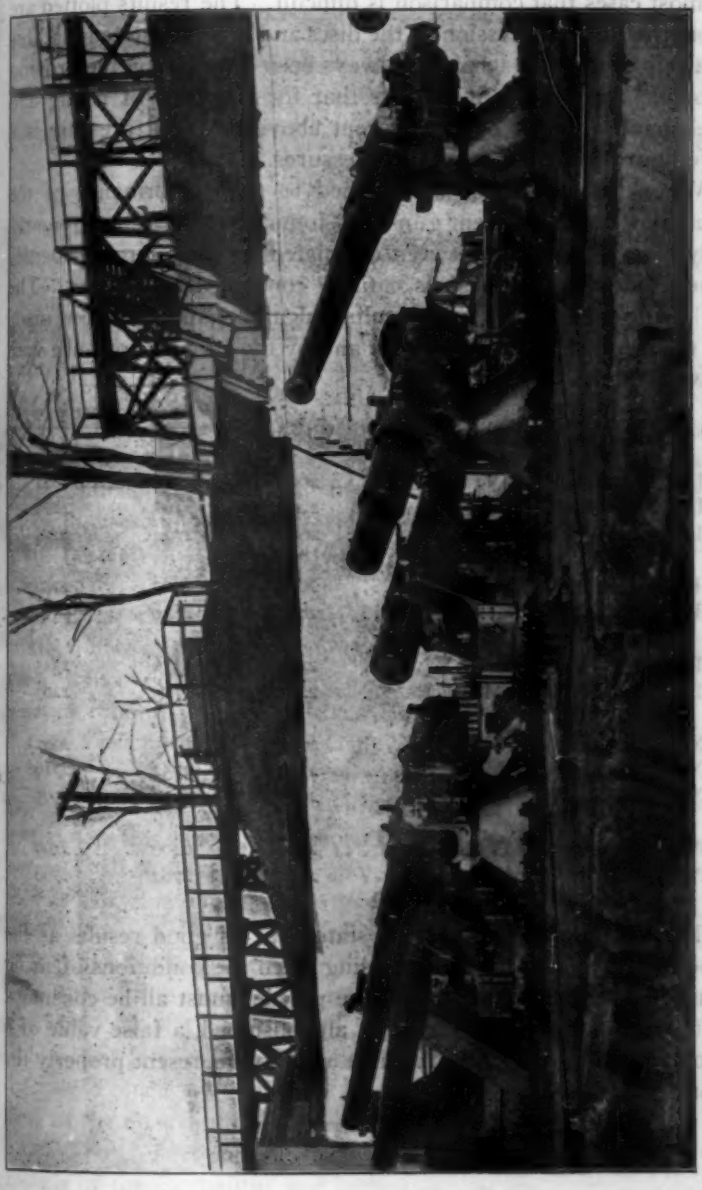


PLATE 3.—SPECIFIC GRAVITY OF NAVY POWDER. WATER AT 4° C.

$$\text{Sp. gr.} = \frac{12.3728 - .132\ \text{T. V.}}{7.4}.$$

Plotted on a large scale, the space-pressure curve was measured with a planimeter for each gun. In all cases, except in the shortest gun, these measurements were found to agree, within two-tenths of 1 per cent, with the muzzle energy calculated from the actual velocity found in each gun.



GUNS USED IN EXPERIMENT NO. 1.

The results obtained by the bore-pressure gauges are so erratic in most cases that comparison is difficult. The results plotted are from the full compression of the discs and it can be stated that this is a fair average of what has always been obtained on the proving ground. In general, it appears that for this type of rifling and shell band a factor of 12 per cent above the shell pressure is a safe figure for calculating gun pressures.

When these formulæ are applied to the performance of the same powder in different guns it is found that they show remarkably close agreement between calculated and measured velocities when the powder charge is entirely consumed in the gun. The following table shows such results, calculations having been made by the original Le Duc formulæ and by the Le Duc formulæ with new constants.

Powder		Gun	Velocity	Velocity calc. from average β	
				Le Duc Old style	Le Duc New Style
IHL	1	6-inch 50 VIII-2.....	2660	2689	2664
IHL	1	6-inch 40 III.....	2203	2161	2205
IHL	1	5-inch 50 V.....	2685	2724	2678
LRFD	2	12-inch Mk. VII	2900	2907	2910
LRFD	2	12-inch Mk. VI	2850	2840	2939
IHPB	12	5-inch 50-Mk. V	2350	2376	2345
IHPB	12	5-inch 40-Mk. III.....	2200	2175	2203
IHX	1	13-inch 35 No. 34.....	2000	1965	2007
IHX	1	7-inch 45-Mk. I	2700	2752	2710
IHX	1	8-inch 45-Mk. VI	2600	2611	2595
ISPB	3	4-inch 50 VII	2500	2406	2499
ISPB	3	3-inch 50 VI.....	2700	2782	2700

The formulæ in the present state give as good results as the modified Sarrau formula. In using them the conditions of firing must be accurately known and the powder must all be consumed in the gun. If the powder is not all consumed, a false value of b is obtained and the pressure curve will not represent properly the work of the powder in the gun.

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

PREPARATION IN PEACE AND SUCCESS IN WAR.

Translated from the *Marine Rundschau*
By COMMODORE W. H. BEEHLER, U. S. Navy.

Our professional literature abounds more and more prominently with details of strategy and tactics. These are important factors, but it is possible to emphasize their importance too much. Our successors must not be taught that every victory is due solely to the superior tactics of the victorious admiral. In every battle—especially where one fleet was practically destroyed—the victorious commander took some steps that must be regarded as theoretically wrong. Such as Nelson's perpendicular attack upon the allied fleet at Trafalgar and Togo's evolution in the face of hostile fire.

As a rule the English understood that the object of studying strategy and tactics was that, the battle is the objective, or that the destruction of the enemy is the object of every measure—without confining themselves too closely to the tactical theories; but the French, though great tacticians, have not so understood it.

At the naval school one learns but little of naval history; this study is first taken up afterwards in the service, but whoever undertakes this study must thoroughly understand that the foundation of all success depends upon the internal efficiency. Herein they will be convinced of the great primary importance of preparation for war. For example, before considering the battles of Nelson's period, a comparison of the efficiency of the navies will demonstrate that a period marked by a Trafalgar was bound to come.

This article proposes to outline the development of the English and French navies at the close of the eighteenth and beginning of the nineteenth centuries, to show that the final destruction of the French fleet was but the logical result of the circumstances. Details of the campaigns and battles are presumed to be familiar to the reader.

THE FRENCH NAVY AT CLOSE OF THE EIGHTEENTH CENTURY.

The Bourbons left France with a navy full of the glorious deeds of a Suffren. Its organization was the product of the genius of Colbert and fully met all requirements. The French naval officers were well selected and efficiently trained, the personnel of seamen and petty officers was then—as it is to-day—excellent and the navy fully justified the highest hopes of the country.

The revolution had its effect on both the army and navy, the older naval officers—suspected aristocrats—were, however, not supported by the revolutionary government in measures to enforce discipline. Soldiers and sailors alike were blinded by political partisanship and great changes were evolved by the confusion. The army revived in a remarkably short time and was fully rejuvenated. The government gave the military leaders full powers to establish an iron discipline and these leaders understood how to inspire officers and men with an enthusiastic zeal bordering on fanaticism such as was signally lacking among the hirelings of the opposing armies. The French army thus had the chief requisite for victory. The new generals of the Republic and their young soldiers broke with the old traditional tactical theories and success justified them in doing so. The allied coalition armies were defeated and the revolutionary contempt for ancient traditions triumphed.

Likewise they attempted to discard the ancient customs and regulations of the navy, but that which proved to be the saving genius of the army was madness for the navy. Unlike the army, the navy was not thereby rejuvenated, but on the contrary it was simply ruined. Consider how much the manual of arms and military parades contribute to discipline and yet may be neglected at times, whereas sail drills and evolutions in seamanship were indispensable and proficiency therein was absolutely necessary for proper use of naval guns in action.

It is incomprehensible how the French could have so misprized seamanship, or how they could have consented to abolish the corps of naval gunners merely because they were suspected aristocrats. But then it was even contemplated to have the French navy resort to the old Roman galleys and the boarding-bridges.

The effect of inadequate supplies operated differently in the army and navy. Bonaparte led his ragged and half famished troops to Italy to victory upon victory and fed and clothed them

in the enemy's country. But it was impossible for Villaret Joyeuse to keep the sea without provisions, with foul and leaky ships whose masts and rigging were rotten and whose sailors had nothing wherewith to protect themselves in the icy December winds nor against the seas and drenching rain. (Expeditions of December, 1799.)

The old navy regulations could not be dispensed with and the French navy thereby lost the efficient corps of officers, its capable administration and the training of its personnel.

The gradually diminishing naval officers of the old French royal navy were replaced by bad, inefficient and numerically inadequate officers. It was difficult to get any officers at all. In 1794, eleven years before the battle of Trafalgar, a French admiral went to sea with 16 captains of ships of the line, of whom three years previously, three had been lieutenants in the Royal navy and the others were sub-lieutenants, merchant ship captains and enlisted men. The admiral himself had only reached the rank of lieutenant at that time. What could be expected of a fleet with such inexperienced commanders or how could they train a corps of officers to be efficient?

The administration of the navy fell into incompetent hands who had not the slightest idea of the needs of the navy. They considered "*elan*" would supply all deficiencies, if not, the admirals were traitors. The most responsible positions were given to visionaries whose only qualifications were that they had good intentions. After one of such officers had left the ministry—Jean Dalbarade—it was discovered that the list of ships of the French navy was so imperfect that orders were issued to fit out this and that ship which had long before been captured by the British.

This new inefficient corps of naval officers never realized their condition. Ignorance goes hand-in-hand with arrogant infatuation. Hoche wrote in 1796: "God preserve me from the navy. All kinds of insubordination and a cultivated lack of discipline prevail in this military organization. Combine ignorance with foolish vanity and you have the picture."

The effect of such an inefficient corps of officers was evident. Good men deserted and were either not replaced at all or were substituted by unwilling conscripts. M. Najac, Ordonnateur de la marine, at Toulon, wrote to the minister in 1798: "*L insub-*

ordination invétérée des gens de mer dans la plupart des quartiers de l'ouest, leur aversion prononcée pour la service, rendent presque nul les efforts des commissaries de l'inscription maritime."

Under such circumstances the French navy carried on the wars of the Republic and Empire. It was not surprising that they could accomplish nothing and that their condition grew worse. The French fleets were blockaded in port and unlearned the little they had acquired, while the British gained experience cruising at sea. Whenever they put to sea and encountered bad weather they returned to port damaged while the leaders and even Napoleon himself believed that the ships were protected and more efficient by staying in port and that the British would be weakened and damaged by keeping the sea. Nelson wrote, March 13, 1805: "Bonaparte has often made his brags, that our fleet would be worn out by keeping the sea, that his was kept in order and increasing by staying in port; but he now finds, I fancy, if Emperors hear the truth, that his fleet suffers more in one night than ours in a year."

Single English ships hovered around and attacked a whole French squadron without suffering any damages while the French only gained few minor successes accidentally.

Fortune in the long run favored the efficient.

THE SPANISH NAVY AT THE CLOSE OF THE EIGHTEENTH CENTURY.

As the Spanish navy was allied with the French after 1796 its condition must also be considered. It suffices to refer to the long series of reverses that the Spanish navy suffered after the destruction of the Armada, to realize its inefficiency. The only good part of the Spanish navy was that which was furnished by their colonies. As the Spaniards had previously been allied with the English the condition of the Spanish navy was well known to the English officers.

THE ALLIED FLEET OF VILLENEUVE.

The destruction of the Franco-Spanish fleet was prepared during the period from after 1793 and was finally accomplished at Trafalgar. Villeneuve's fleet comprised the nucleus of all that carried the French and Spanish flags. The fleet was developed from the eleven ships of the line at Toulon. When Admiral Lat-

ouche Trouville, who was Villeneuve's predecessor, took command, in 1803, he found it deficient in every particular. There was no idea of anything to be done with the fleet. The officers were not even accustomed to sleep on board. (Jurien de la Gravière.)

The energetic and competent Latouche tried his best to improve the navy. He began with drills and short cruises and slight skirmishes with the enemy improved the moralé. In fact everything was progressing finely when all ceased by his sudden death August 2, 1804.

It is not clear how Villeneuve happened to be chosen to succeed him. Napoleon is said to have remarked that he had the best luck—he had escaped from the battle of the Nile. He was, however, a brave man and not incompetent. But the condition of the fleet was enough to make the most efficient commander doubtful. Villeneuve soon broke down under the task. The inefficiency of the fleet was evident to him and the correspondence of this unfortunate admiral gives a graphic view of its miserable condition. He wrote December 19, 1804: *"Les commis aux vivres sont ordinairement des couquins qui embarquent le moins possible et que malheurpeusement la surveillance des officiers n'éclaire pas assez."* Again to Decrès on January 19, 1805, after the first sortie under Villeneuve he wrote: "Our squadron looks fine in the roads of Toulon. The crews are well clothed and drill well, but in bad weather things change, they are not accustomed to bad weather." Bad weather had compelled the squadron to return with damages to port.

With this deficiency in seamanship the artillery training was even worse. Jurien de la Gravière claims that many of the gun captains had never fired a gun before the battle of Trafalgar.

Many of these deficiencies would have been remedied by strict discipline. Surely with strict gunnery drills they could have obtained the same rapidity of gun-fire of which the British navy boasted. But at this period the French did not respect the old navy regulations. A French writer states that instead of sharp vigilance and systematic service they relied on exaggerated self-sacrifices and heroic intrepidity. The Admiral should have exerted pressure upon his captains but these were so deficient that he did not know where to begin.

When the fleet came in to anchor at Ferrol in August, 1805, the ships all collided with each other. Villeneuve then wrote of

his captains: "I believed they would all keep position but none of them seemed able to act with decision."

With such a personnel it is unnecessary to consider any details concerning the matériel of the fleet. A bad, inefficient personnel cannot accomplish anything even with the best matériel.

The prevailing distress in the French ports was one great cause for the deficiencies in the equipment and supplies of the French fleet. Villeneuve's letters are full of complaints. But on the other hand it must be remembered that owing to excessive economy the British were not much better provided. In the French navy there was no Troubridge whose resources equaled the demands of a Culloden.

In this condition Villeneuve's fleet went to sea to fight. Villeneuve wrote: "The lack of seafaring experience of our officers and men and war experience of our captains combined with the great deficiencies in all requirements were such that even a slight disturbance at night threw everybody into confusion."

If the slightest accident at night could cause the admiral such anxiety what would not be dreaded on meeting the enemy? The battle with Calder, who attacked Villeneuve's fleet of 20 French and Spanish ships with but 15 British ships upon his return from the West Indies, July 22, 1805, and captured 2 Spanish ships of the line, gave him a foretaste of what to expect. Villeneuve wrote after this engagement ". . . . we have bad masts, bad sails, bad rigging, bad officers and bad seamen. Sickness prevails among the crews. The enemy is aware of this and ventures to attack with very inferior forces. Our captains have had so little war experience and are so unaccustomed to manœuvers that they only know to follow the leader and thus we are ridiculed by all Europe." Several hundred invalids were landed at Vigo from Villeneuve's fleet upon his return from the West Indies.

At Trafalgar Villeneuve's fleet of 18 ships of the line was reinforced by 15 Spanish ships under the command of Admiral Gravina.

In 1795, when Spain decided to ally with France, Spain agreed in the treaty to provide 14 ships of the line and Nelson wrote: "I assume it to be certain that these ships will not be manned, for otherwise that would be the best way to get rid of them." Villeneuve's letters show that he entertained the same opinion. The ships material was in some respects very good—though much neg-

lected. The worst complaints were in regard to the personnel. The Spanish crews were designated as a "*racaille épouvantable*" by General Beurnonville to Decrès or as "*gens sans feu ni lieu*" by Jurien de la Gravière. Villeneuve said: "It is sad to see such handsome and powerful ships manned by herdsmen and beggar monks." A Spanish officer, who fought in the battle of Trafalgar, described the inefficiency of the crews with all kinds of expressions and the avowal that they were incapable of anything except to compromise the fleet (Escaño). It must be confessed that these crews should have had a better military training and should have been drilled more. It was evident that in all maneuvers they were very slow and they were unable to make even the slightest repairs to the rigging.

Every naval officer will clearly understand the anxiety and worry of the commander-in-chief over the Spanish squadron during the cruise. Villeneuve wrote to Decrès: "*La division espagnole et l'Atlas me faisaient arriver tous les matins de quatre lieues quoique la plupart des vaisseaux fussent la nuit sans voiles.*"

A part of the Spanish division joined the fleet just before the battle of Trafalgar. And as but little could be expected from the Spanish ships that had accompanied Villeneuve on the cruise to the West Indies and return, there was absolutely no dependence to be placed on the new ships. In a council of war before the battle it was established that "*que plusiers de ces vaisseaux n'avaient pu encore exercer leurmonde à la mer, et que les vaisseaux à trois ponts, la Santa Ana, le Rayo, le San yusto, armés avec précipitation etè peine sortis de l'arsenal, pouvaient à la risque appareiller avec l'armèe, mais qu'ils n'etaient point en etat de rendre les services militaires dont ils seraient susceptibles, quand ils seraient complètement organisés.*"

There is still another feature that diminished the value of the Spanish allies. The French fought for their country, while the Spanish fought for the French. They had but little interest in the cause. April 6, 1805 Admiral Salcedo refused to leave Carthegena with his six ships of the line to join Villeneuve. Under such circumstance everybody was inclined to ascribe all errors and accidents to their allies. The fact is reported that Admiral Gravina was the only Spanish naval officer who willingly supported Villeneuve. The engagement with Calder furnishes a good example. The Spaniards blamed the French for the loss of the two ships captured by Calder and claimed that the French

had left these two Spanish ships in the lurch while the French held the Spaniards responsible for their loss. The controversy was so bitter that the intendant of the marine and artillery commandant at Cadiz refused to furnish the French with any provisions or ammunition without cash payment. The difficulty was only overcome through diplomacy. On July 21, 1805, Villeneuve wrote, even before the first engagement: "Would to God that the Spanish ships had not joined this fleet. These ships can only compromise us all."

In the foregoing attempt to explain the condition of Villeneuve's allied French and Spanish fleet and the causes that produced that condition exception will be claimed. It may be said that certain bad features have been deliberately selected and emphasized to show the inefficiency of the allied fleet. But no one can deny that with all these defects there were some good features in that fleet. At Trafalgar both the French and Spanish fought like lions. There was no Nebogatoff in that fleet. They did the best of which they were capable. But this lack of ability is the main point. The inferiority of the allied fleet was due to the lack of ability in the personnel that could not be replaced by any degree of zeal or bravery. It must be conceded that the average man in each fleet was equally brave and fought with equal courage since the average man is not a coward. There are, indeed, certain national virtues and vices that have a tendency to make a people apt to qualify as seamen but skill is the great requisite for efficiency in sea battle. The lack of skill in the personnel of Villeneuve's fleet was so great that nothing could be expected from it. Here and there individuals did prove efficient but the average decides, and the average skill in Villeneuve's fleet was so inferior that the greatest strategical genius and cleverest tactics were unavailing. It is not surprising that such a debauched fleet should have earned defeat, the wonder is that they were not sooner destroyed. Why was it necessary for a Nelson to appear? This can be answered by considering the condition of the British navy at this period.

THE BRITISH NAVY AT THE BEGINNING OF THE NINETEENTH CENTURY.

While Mahan, in "*The Influence of Sea Power upon History*," describes the condition of the French navy after 1793 more fully than possible in this brief sketch, he gives very few details about

the British navy. He briefly mentions deficiencies without laying sufficient stress upon the importance of these deficiencies and their effect upon the results.

The requirement to be always prepared for war, even when there was no urgent necessity apparent, is a much more recent policy of England. At all events they had not reached this standard in 1793 any more than in the war of American Independence, in 1773, nor in the American war of 1812. Preparedness for war requires that a strong fleet shall be kept constantly in commission. The strong plutocratic element in the British parliament found it difficult to provide the necessary appropriations for the navy, and the few ships that were kept in commission were so inadequately provided that subsequently they were obliged to expend twice as much in war.

The naval administration was corrupt. In 1801 Sir John Jervis designated the civil branch of the navy as an "*Augean Stable.*" Corruption and neglect prevailed among the contractors and prize agents. Marryat's novels, though works of fiction, give a clear idea of the almost inconceivable corruption that prevailed in many British ships. The worst feature was that of the personnel. The sailor led a dog's life on board ship. With the greatest care it was difficult to get bare necessities and when, as frequently happened, the captains neglected their duty the conditions were unbearable. Brutality prevailed instead of strict discipline and immorality instead of virtuous examples. Very few volunteers would risk service in the British navy with brutal captains. They were obliged to resort to the press gang and men were given a choice to serve in the navy or go to prison. The character of a rabble recruited by such means can be imagined. In 1796 Collingwood wrote: "I have on board a motley crew from all countries: Germans, Austrians, Poles, Croatians and Hungarians." But certainly even such a personnel could be trained under proper leadership to accomplish something but the proper leadership was not always available, and, therefore, they had the great mutiny of 1797, when a sailor leader of the mutineers commanded the Thames and paralyzed the commerce of London. This experience was the fault of the bad element in the corps of officers. In their efforts to economize much had been overlooked.

These conditions clearly explain why the British navy in the wars with the republic were not as successful as might have been expected from the very first. Nothing can be accomplished with

bad interior economy. The inferior officers will only reveal their inferiority in battle. On the glorious first of June many of the British captains were notoriously incompetent.

But there is no doubt that the nucleus of the British naval officers was efficient. This nucleus fully recognized their own deficiencies and labored to correct them. The wars displaced the inferior officers and produced good men from before the mast, among whom we find Admiral Jervis. Jervis was not the only reorganizer but he was the best and most successful. His work is mentioned as an example how to build up and develop an efficient navy, especially since the officers and men trained by Jervis formed the nucleus of the victorious fleet at Trafalgar.

Sir John Jervis relieved Hyde Parker in command of the Mediterranean fleet November 30, 1795. He had previously distinguished himself in battle but was better known for the manner in which he commanded his ship, for his iron discipline and thorough efficiency on board his ship.

Upon taking command of the squadron he introduced his system on board the ships of the fleet. He began by thoroughness in small details as with the much neglected uniform regulations. We now know how he beguiled the long uneventful period before the battle of St. Vincent. Jervis began his work by strong pressure upon his captains. He placed an entire staff under arrest whenever he had any occasion to be dissatisfied. He required his captains to exercise as much care for the welfare of their crews as he had done when he was a captain. In case of any lack of discipline the captain would not be permitted to sleep ashore. We recall that when Latouche Trouville took command of the French fleet at Toulon none of the officers were accustomed to sleep on board. The discipline of the officers insured the discipline of the men.

Jervis himself personnally developed this discipline by requiring the most painstaking and thorough clothing inspections indicating that nothing was beneath his notice. He rewarded personal service, the family claims of those who had lost a father or brother in the service, and the very friendlessness of a dutiful man received his best patronage.

A crew that is being trained to the highest proficiency will be properly handled and they must learn something. Jervis found much to do. He it was who introduced ventilated hospitals on

the gun deck. Also the regular routine of airing bedding that he required should be entered in the ship's log. The beneficent effect of these measures is illustrated by a comparison of the health of the British with that of the French crews.

In caring for his men he kept them busy. His hobby was the exercise of great guns and practical seamanship. He designated everything else as "frippery and gimcrack." He required daily gun drills. Consequently on the best British ships: *Foudroyant, Dreadnought,* etc., they fired one shot per gun per minute, while the French could only fire one shot per gun once every three minutes.

Jervis is described as a pedant. It is said that he always required every officer and man to salute him with raised hat and always to appear at flag parade in full uniform. But are not military forms the greatest aids for discipline? And was not the British admiral right in disciplining the British navy through little details? All these apparent trifles had an ennobling effect when used for such an objective rather than merely to gratify the personal vanity of an individual.

Jervis succeeded. He was rewarded by the honors that Nelson received through this Mediterranean fleet; since Nelson recognized his work. The majority of the captains must have felt as Nelson did, otherwise they would not have formed such a band of brothers.

The work of a preparer is not agreeable and he is subject to sharp criticism. St. Vincent's method of training were not English and even Mahan fails to give the old iron lord full credit for his work. The acute opposition he stirred up deceived the ear of his contemporaries and it was left for the future to properly estimate its value. Jervis was like Friedrich Wilhelm the First whose great work of preparation in peace has only recently been recognized as having made the great deeds of Frederick the Great possible. Genius requires the work of the ordinary man and spurs him on to faithfully perform his simple task with average ability without other consideration.

After the battle of the Nile, Nelson wrote to St. Vincent: "We owe you the victory at Aboukir." This was not a mere compliment but a recognition of the truth that does not belittle but enhances Nelson's genius. In the last analysis the British owe their victories at Aboukir and Trafalgar to the superior ability and this

superior ability was due to their organization that Admiral Jervis had introduced.

Before this reorganization had been introduced the results of the battles could only be meagre notwithstanding the inferiority of the French fleets. Compare Lord Howe's fleet on June 1, 1794, with that of Jervis' at St. Vincent, in 1797. On the former neither signals nor maneuvers functioned as they should and the conduct of some of the captains was questionable—such as that of the leading ship *Ceaser*. In the latter, signals were not necessary because the leader knew the admiral's plans and the modest commander only had the highest praise for the closed formation that had been maintained during the previous night. On June 1 a better trained fleet than that of Lord Howe would have destroyed the numerically equal French fleet that was in no respect one whit better than the allied fleet at Trafalgar. Jervis attacked 27 French and Spanish ships with but 15 British ships at St. Vincent, but the political situation operated to prevent Jervis from using all his forces to make that victory more decisive.

But, besides, it was necessary for the British to have time in which to learn of the inferiority of the French fleet. The uncertainty of what the enemy might be able to do is often liable to cripple the decisions of a commander. A Nelson could naturally perceive this inferiority quicker than any other, and this perception encouraged him to operate as he did at Aboukir and Trafalgar. Nelson despised the enemy and relied upon his superior efficiency and the results justified him. The message Nelson sent to St. Vincent after the battle of the Nile proves that he recognized the true cause of the superior efficiency of the British fleet.

NELSON'S FLEET.

Nelson depended upon the work of his predecessor though he was far inferior in genius. It is difficult for many to recognize this fact but "the appearance of a prodigy like Nelson is not an isolated event, independent of antecedents. It is the result of a happy meeting of genius and opportunity. The hour has come and the man. Other men labored and the hero enters into their labors."

It was natural that officers and men almost deified Nelson while they despised Jervis. The pressure of the superiors was not as

heavy with the former as with the latter. They did not need it because the new order that had been prepared by Jervis was in full operation. Thus Nelson could take another step in training his officers. He taught his captains to think as he did and succeeded so well that at Aboukir every captain distinguished himself, something which had never been known before that battle of the Nile. It is interesting to note that Nelson did not oppose St. Vincent's ideas and was not a stranger to his system. He was not one who merely impetuously fell upon his foe as many superficial readers claim. He who thoroughly studies the character of the great admiral will perceive that he thoroughly went into every detail of internal management and discipline as he had been taught by Jervis.

Nelson's painstaking, accurate personal observations of the barometer and his precautionary orders for stormy weather elicited the astonishment of a French writer . . . . *"le bouillant amiral ménageait ses vergues et ses voiles dans les circonstances ordinaires plus soigneusement, que son vaisseau ou son escadre dans les occasions decisives."* But as stated it was not so in the French fleet. Perfection in internal management and discipline cannot be obtained without a certain amount of pedantic thoroughness. But it was exactly the perfection of internal management of the British ships that justified Nelson in decisive moments to be bold and impetuous.

We find that Nelson followed in Jervis' footsteps. Mahan states that Howe, "the sailor's friend," did not provide for his people any better than Jervis did. Nelson did likewise. Nelson even justified the claims of the mutineers of 1797.

Nelson concerned himself personally in regard to the subsistence of his crews. The grand admiral did not think it beneath him to investigate the tests to which dried prunes and fresh and salted fish were subjected before being issued to the men.

We recall the words of Frederick the Great: "A soldier fights as he is fed." The private man must be conscious that his superior officers are concerned about his welfare. Work for the men must accompany working with men. Without both neither French —*"elan"*—nor British tenacity will avail.

The foregoing suffices to illustrate the condition of Nelson's fleet. Indeed, nothing was perfect and the British made many mistakes, but the average was capable and they knew their own

efficiency as well as the incapability of the enemy. These conditions made them energetic and inspired them with a determination to win so that every British captain, officer and man was most anxious to "board the enemy." The fruit of Trafalgar was ripe.

It is only when the underlying reasons are clearly explained that we can understand why the destruction of the allied French and Spanish sea power was bound to come. On the one hand we have superior leadership and a far greater efficiency in the fleet while on the other hand an inferior leadership with a complete lack of efficiency.

History shows that occasionally a brilliant leader may accomplish something with a defective personnel but it is only temporary and will not last. Whereas, thorough training is much more likely to repair the errors of a leader; besides the navy which is efficient is much more likely to produce the man for the hour.

The foundations for success in war must be laid in daily service at sea in peace. The young officers serving at sea should be impressed with the importance of these facts. It is often difficult to appreciate the value of the endless drudgery of the daily routine.

There are many embryo Nelsons who even as young lieutenants are much more concerned with strategical studies than in clothing inspections but this does no harm. This article is not intended to depreciate those studies because there is much in common in the tactics of the old sailing ships with modern tactics. We can, however, emphasize the fact that our work in the navy to-day is very similar to that peace preparation for war of the old times and which laid the foundation for success in the wars. The ideal joy in the service is emphasized for the young officers when they clearly realize its importance from their historical studies.

(Signed) GERCKE.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

HOW TO MAKE A NAVAL APPROPRIATION.

By Pay Director Livingston Hunt, U. S. Navy.

To the average naval officer the subject of naval appropriations does not strongly appeal. He dreads the array of figures, the strange technicalities of bookkeeping, the numberless presentations of a single item, the apparent confusion of debits with credits; yet, even to him, I believe there would come an hour or two of interest in dry statistics, if he were to have the opportunity to examine the British estimates of naval appropriations for the year 1912-13, and would proceed to compare them with his own.

In the first place it will interest him to find himself studying the appropriations of a foreign country in a language which makes him feel as if the subject-matter in hand were intended to be written for his own country. At once the method of handling the subject is brought within his easy comprehension, and his attention is aroused by the way a foreigner treats a matter which is of vital importance to him. He cannot fail to begin thinking, comparing and analyzing. With a navy about two and half times the size of our own and with an annual expenditure about 75% greater; with an experience that is larger and longer than our own, and with a conservatism that is averse to mere experiment, he will feel that he cannot afford to condemn, without examination, the methods employed by the English in appropriating money for running so colossal an establishment as their navy. First of all he will be enlightened by ascertaining that the estimated grand total of naval expenditure for the fiscal year in Great Britain amounts in round numbers to $225,000,000, and in the United States to about $125,000,000, or $100,000,000 less than in Great Britain. These big numbers are impressive and we naturally proceed to inquire into their components, that is, to find out how many divisions of expenditure are included in the acts of legislation which authorize such huge appropriations. The English

method of legislation for an appropriation is simple in the extreme. Only fifteen headings dispose of it all. Fifteen grand divisions of naval expenditure, and no more, are all that are voted by the British Parliament annually. Here they are for the current fiscal year:

II. EFFECTIVE SERVICES, 1912-13.

1. Wages, etc., of officers, seamen and boys, coast guard and royal marines	£7,801,500
2. Victualling and clothing for the navy	3,359,437
3. Medical establishments and services	289,965
4. Martial law	3,600
5. Educational services	218,885
6. Scientific services	103,789
7. Royal Naval Reserves	436,432
8. Shipbuilding, repairs, maintenance, etc.	
Section I. Personnel	3,515,800
Section II. Material	5,457,100
Section III. Contract work	13,230,600
9. Naval armaments	4,064,700
10. Works, buildings, and repairs at home and abroad	3,547,000
11. Miscellaneous effective services	545,386
12. Admiralty office	437,350
Total Effective Services	43,011,544

III. NON-EFFECTIVE SERVICES.

13. Half pay and retired pay	977,212
14. Naval and marine pensions, gratuities, etc.	1,547,126
15. Civil superannuation, compensation allowances, and gratuities	413,410
Total Non-Effective Services	2,937,748
Grand Total	£45,949,292

Now let us look at our own list of estimated appropriations for the same period as shown in the honorable secretary's report last December. I would like to insert all these estimated appropriations in this article, but to do so would make the article appear like a side-note to the estimates. It takes about twenty pages of the secretary's report to enumerate them. No less than two hundred and forty-odd items, or separate appropriations—all to be embodied in the law—are requested for the fiscal year. Not everything imaginable for navy purposes is estimated for, but a pretty fair start in that direction is made. For instance, under

the Bureau of Navigation we find separate and individual appropriations requested for the following purposes:

Transportation.
Recruiting.
Contingent.
Gunnery exercises.
Steaming exercises.
Experiments in aviation.
Outfits on first enlistment.
Maintenance of naval auxiliaries.
Naval training station, Colorado.
Naval training station, Rhode Island.
Naval training station, Great Lakes.
Naval War College, Rhode Island—maintenance.
Services of a lecturer on International Law.
Services of civilian lecturers.
Care and preservation of library, etc.

These are a few of the 240-odd estimated appropriations to be legislated for. There are separate and distinct appropriations ranging from the sum of $100 for traveling expenses for collection of records, up to very large sums. Continuing our comparison and selecting one of the most striking differences in the two papers before us, we find that our British friends appropriate funds for "Works, buildings and repairs at home and abroad" under one single heading, whereas we cannot accomplish the same end without employing less than one hundred and fifteen separate appropriations under the general subject of "Public works." One to one hundred and fifteen! How do they do it? Why do they do it? Let us see. In the first place it is only common sense, from the point of view of the accountant, to combine and classify the great general purposes of the naval establishment under a few heads of expenditure. This indicates in financial language the doings of the navy and the measure of its achievement of its purpose. A few, and only a few, great ledgers of bookkeeping are the natural corollary of this general scheme. In the opinion of the present writer, simplicity of bookkeeping alone would justify a small number of large appropriations in providing for a navy. In charging up expenditures for the many items and services pertaining to our own navy, we are forced to search among two hundred and forty-four appropriations or ledger accounts for

the current fiscal year, and about as many more for the previous fiscal year, in order to locate our charges properly. A small number of appropriation accounts grouped according to similarity of purpose would seem to be sufficient. Herein lies the secret of the merit of the English system; it first grants large lump sums and then exacts minute and numerous accounts of their use. The British annual appropriation with its short list of money grants is based on an annual publication called the "Appropriation Account," which the British government prints, and which rigidly accounts, in thousands of items, for every cent which has been expended for the navy during the previous year. With us the attempt is made to appropriate separately for each small item of account. With the British the multiplied account comes after the granting of the big sum, not before; and each little account is not inserted in the language of the appropriation act.

After the bookkeeping, the most noticeable advantage of the British method of appropriating money is its economy. There is no doubt that with us it is also a belief in economy, and not a regard for bookkeeping, which makes our government insist upon enacting into law a multiplicity of appropriations with a specifically stated sum of money for each one. For instance, it knows that to limit the outlay for an ammunition store-house to $1000 is to prevent the Navy Department from spending one dollar more upon it. Nevertheless, if, with the most careful attention, the store-house cannot get roofed in for the sum mentioned, the Department must, perforce, request the immediate passage by Congress of an Urgent Deficiency Act before it can go ahead and complete the roof. It is apparently considered by our government to be unwise or extravagant to allow a cabinet minister the privilege of applying to the unfinished roof any funds which may be in excess of the needs of some other item of appropriation. Yet economy is not attained, for either the building just described must stand unfinished, and thereby deteriorate, or else a Deficiency Act must be rushed through Congress. Simpler and equally economical in expenditure, and more economical in time, effort and management of business, would be to give the Secretary of the Navy the right to apply a surplus of one item of appropriation to a deficiency in another.

The inclusion under one big appropriation of many small kindred objects, without actually naming them, naturally sug-

gests the right of the administrative power to so allot the big appropriation among the many small items as to permit the transfer of an excess in one allotment to a shortage in another. In this right to employ an excess in one place to wipe out a deficiency in another we would be spared much or all of the extra deficiency legislation which we must ask for every year. This right, as a matter of fact, is exercised by the British Admiralty, not only between the many small unnamed items that are covered by each grand appropriation, but also between the fifteen grand appropriations themselves.

The incentive to economy in expenditure is always present with every Secretary of the Navy and every administration, because every Secretary of the Navy likes to compare favorably in this respect with his predecessor. Under our present system he has every year to offset an attractive statement of surpluses, which he has managed to save out of certain appropriations, by a list of deficiencies in others which unforeseen exigencies compelled him reluctantly to incur. It is instructive to note that the Deficiency Act for the year 1911 and for previous years carried a total of $547,762, whereas the surplus balances left from appropriations for that year and for previous years amounted to $3,702,556.33. The writer has not separated the appropriations for the various years in the above figures, but he is certain that the Deficiency Act for 1911 would have embraced a very small sum, or would have been non-existent, had the Navy Department possessed the right to apply a surplus to a deficiency. Since 1900 there have been naval deficiency acts passed to the amount of over $55,000,000. This large amount of money was absolutely necessary to carry on the navy, notwithstanding the caution of our legislators to provide an exact limit to the several hundred small items which they had embodied every year in the naval appropriation acts. There has always been, and there always must be, a long list of annual deficiencies under our present system of making appropriations. But it will not be easy to change the present system, for the aversion of Congress to granting "lump sums" is proverbial. We must deal with this aversion and prove that to appropriate a large sum of money for one general purpose, such as, for instance, for "new batteries for ships," is not to lose control of the economical expenditure of every cent of the large appropriation any more than if each of the separate small ob-

jects to which the large fund applies had been appropriated for by special legislation. This complete control can be obtained by Congress by the simple process of following the British plan of exacting from the spenders of the appropriation an exact accounting of every cent expended.

As a result of his study of the matter of navy appropriations, the writer suggests the following scheme of items for a naval appropriation act, knowing it to be imperfect but believing it to be worthy of examination by others, to the end that a body of thought and opinion on this important matter may be formed and may in time effect a desire to change from our present troublesome and antiquated system. The scheme suggested is experimental and perhaps some of the subjects under one heading may more properly be included under another:

AN ACT making appropriations for the naval service for the fiscal year .....

Be it enacted, etc.—That the following sums be and are hereby appropriated for the naval service for the year ending .....

FLEET EXPENSE.

1. Pay and allowances of officers and enlisted men..... $.....
2. Fleet expense at yards and stations—
   (a) Labor and material for repairs, outfitting and manufacturing for fleet..... $.....
   (b) Purchase of supplies of all kinds (except provisions and clothing) ..... $.....
   Total..... $.....
3. Provisions and clothing..... $.....
4. Miscellaneous fleet expense (colliers, fleet running expenses, emergencies, miscellaneous)..... $.....
5. Increase of Navy—
   (a) Ships ..... $.....
   (b) Armor and armament ..... $.....
   Total..... $.....

SHORE EXPENSE.

6. Maintenance of yards and stations..... $.....
7. Miscellaneous shore expense (hydrographic office, Naval militia, purchasing offices, miscellaneous.....
8. Hospitals and medical department ..... $.....
9. Navy Department ..... $.....
10. Naval Academy ..... $.....

11. Marine Corps ..... $.....

LIEUT.-COMMANDER W. B. CUSHING, U. S. NAVY.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

WILLIAM BARKER CUSHING.

(CONCLUDED.)

By CHARLES W. STEWART.

THE VIRGINIUS AFFAIR.*

The "*Virginius* Affair" gave Cushing an opportunity to show his energy and intuition. Upon learning that the crew of the *Virginius* were being summarily executed he hastened without orders from Aspinwall in command of the U. S. S. *Wyoming* to Santiago de Cuba and promptly called upon the Spanish General Burriel, and it is worthy of note that no prisoners were executed after Cushing's arrival.

The official story of Cushing and his forcible and successful protests against further executions of *Virginius* prisoners is told in the House Report herewith and in Rear-Admiral Chadwick's "Relations of the United States and Spain: Diplomacy." The true detailed story has probably not appeared in any connected form.

The *Wyoming* arrived at Aspinwall September 23, 1873, under orders to remain there until relieved. Her crew was held in readiness to land and keep open transit over the Panama Railway. Continuous drills for "Arm and Away Boats" were maintained. The Royal Mail steamer *Severn*, aground at Manzanillo Point, was gotten afloat October 3. Target practice with the heavy battery of 2 XI-inch, 4 IX-inch and two or three smaller guns gave audible evidence in Aspinwall harbor that the *Wyoming* was able to enforce her commander's wishes. The American steamer *General Sherman*, for participation in some degree in the rebellion in Panama, was seized by Cushing, and his officers and men put in possession. This seizure was later upheld by the United States courts, and the *General Sherman* was condemned at Key West

*Voluminous correspondence and testimony relating to the steamer *Virginius* is in Diplomatic Correspondence and in Executive Document No. 30, 43d Congress, 1st Session. The *Virginius* carried a crew of 52 and 103 passengers. Four passengers were executed November 4, twelve passengers were executed November 8, thirty-seven of the crew were executed November 13, 1873. One hundred and two of the survivors (fifteen of the crew and eighty-seven passengers) were received on the *Juniata* December 18 and landed at New York, December 29, 1873.

and sold by the government. All this gave Cushing some good practice in international law. When he heard on November 8, by cable from Mr. Nunes, U. S. Consul at Kingston, that protection was needed at Santiago, Cushing demanded more facts and learning the truth cabled to Mr. Nunes, Nov. 10, "Am now coaling; will leave to-night or early to-morrow morning for Santiago." The *Wyoming* sailed at daylight, November 11, and, stopping on 15th at Kingston for information and a pilot, arrived off Santiago that night and anchored in Santiago at 11 a. m. the 16th. A letter was sent at once to the general in command at Santiago. The *Virginius* had been taken from Santiago before Cushing's arrival. At the interview between the governor and Cushing accompanied by Lieutenant Hutchins, U. S. Navy, it is said that General Burriel advanced to meet Cushing with hand extended; the more Burriel advanced his hand the more Cushing drew his own hand behind his back. Cushing never took his eyes off Burriel. The governor grew nervous for he had met his master. There was no loud talk. The governor was constantly shaking his right leg, and looking furtively away. He did not like Cushing's stare. It was at this time that Cushing advised Burriel "If he intended to shoot another one of the *Virginius'* prisoners he would better first have the women and children removed from Santiago." Burriel promised not to shoot any more prisoners and further that he would retain the prisoners at Santiago. It is said that Burriel left Santiago that day and the lieutenant governor took his place. The United States later demanded that Burriel be punished, but he was promoted in rank and died in 1877 a major-general.

Cushing's scheme to retake the prisoners was as follows: Cushing was to lay the *Wyoming* to command the main street. One party was to land at night and surround the governor's palace, thus cutting off all communication. Another party was to land and, with a spare topgallant mast for a battering ram, take the jail where the *Virginius'* prisoners were confined and after releasing and arming them, all hands to the ship. Each man was to wear a broad white band on his left sleeve. If this plan had been carried out it is possible that "Cuba Libre" would date from 1874. Cushing was senior to Dewey, Schley and Sampson. If he had commanded the North Atlantic Station in the Spanish-American War one may imagine with what glee he would have visited Santiago de Cuba and attacked the Spanish squadron under Cervera.

This story is told by one of Cushing's officers:

I was on the Asiatic Station when Cushing was there and saw a good deal of him, and I was his navigator on the *Wyoming*. Admiral Emory was with Cushing on the *Maumee* in the east; that was an interesting cruise made by Cushing. We were in the habit of calling him "Albemarle Cushing." Rowan, later vice-admiral, reported that the *Albemarle* had paralyzed our fleet in the sounds. Cushing sunk her with a torpedo boat of his own design—best in those days—crude in this.

Of course, Cushing had his enemies; some from fancied ill-treatment, others from failure to understand his character, and last, but not least, enemies who were jealous of his success. He was the only junior officer that has ever received the thanks of Congress. Cushing was the soul of honor and abstemious to a marked degree, at all times. Nothing would give me more pleasure than to reply to any of his critics during the time that I knew him. Cushing never had the opportunity to acquire a knowledge of navigation or seamanship, but during the Civil War he always had his fighting tacks aboard, and I have heard it from word of mouth about many of his exploits, which he was loath to talk about, but would be brought out by a simple question during our night watches, as well as by day, he captain, I navigator. He had the greatest confidence in those whom he thought loyal to him. He never laid or changed a course in all the time I was navigator with him on the *Wyoming*.

I was with him, his aid, when he called upon General Burriel "The Butcher," an impressive meeting at Santiago de Cuba. He told me that he would retake the *Virginius* and promised me command of that vessel. The Spanish authorities got her out of the harbor a day or two before we arrived, to Cushing's disappointment. Burriel left town the next day after Cushing called upon him. I heard Cushing tell him if he intended to shoot another one of the *Virginius* prisoners, he must first have all the women and children removed from the city of Santiago de Cuba, for he would certainly take the place. It was a grand sight when he stood up and looked "The Butcher" down. Commander Braine was sent down to Santiago de Cuba to investigate the *Virginius* affair; the investigating had already been done by Cushing. It was at this time that Secretary Robeson sent the celebrated despatch to Braine at the New York Navy Yard—"For God's sake hurry on to Santiago de Cuba. We are afraid that Cushing will do something." Well might the Department be alarmed, for Cushing had sailed from Colon without orders, having come there with orders to remain. Cushing was intensely patriotic. Through the cable from Kingston, Jamaica, he heard of the murder of his countrymen, and he immediately coaled ship and sailed. At Santiago one day, after the arrival of the *Juniata*, some of the officers had been crowded off the street by soldiers in uniform on duty, and our officers in uniform; he remarked he would be d—d, if he would stay there; that the authorities had also lied to him. We left leaving the *Juniata* there.

A good many pages could be written about the happenings at Santiago de Cuba during those times, for Cushing was at his best. Upon the return of Cushing and myself from the call upon Burriel, Cushing went on

board the *Niobe*, Sir Lambton Lorraine's ship. This meeting was very interesting, for they were both fighters down to the deck.

Cushing predicted what happened years after his death, the downfall of Spanish dominion in the West Indies. The death-knell, Cushing said, sounded when the order was given to the firing squads at Santiago to "Fire," and poor Ryan, Fry and others fell, shot down like cattle standing facing a slaughter-house wall on the outskirts of the city. Cushing, I, and others saw the spot where their bodies were thrown into a common grave. All this was so crushing to Cushing's feelings, I wondered at the time how he held himself in check and thus avoided bringing on a war. Of course, had he done so, he might have been sacrificed, though I believe that public opinion would have been with him; for *the public has always been good to the Navy, when the Navy was on the fight to redress a wrong.* Cushing did not know when at Santiago de Cuba that mass meetings were being held in New York City to protest against the Spanish outrages. Had he known this I feel assured that he would have taken the *Tornado* and gun-boats then in the harbor and captured the city. It was not known at this time that Cushing was in communication with the Cuban patriots just outside the city of Santiago, who were ready to come in should he make an attack—not that he made any compact with them—he was too honorable—but they communicated their intentions. Whether he replied I do not know.

I was with Cushing the last day that he was on duty. He was the senior aid and I was the junior aid to the commandant of the navy yard at Washington. Mrs. Cushing was very much worried about him, and on his last day asked me to get him to come home. I did not realize how sick a man he was.

He was a devoted husband and father. He loved his wife to adoration. Who was it said "—The bravest are the tenderest, the loving are the daring"? I never knew a man so considerate of other people's feelings.

Another officer has written:

The *Wyoming* was stationed at Colon on account of a revolution going on in Panama, with orders from Rear-Admiral Scott, commander in chief of the North Atlantic Squadron, to remain there until further orders. We had been there some time when the *Virginius* affair took place. Our first knowledge of the seizure of the *Virginius* was by a telegram from the American Consul at Kingston, Jamaica. Cushing decided to coal immediately and leave for Santiago, via Kingston, as the occasion demanded prompt action and he could not waste time in communicating with the Department and waiting for an answer. On arriving at Kingston, we filled up with coal, took a pilot who knew Santiago, and steamed with utmost despatch to Santiago. On our trip from Colon to Kingston we had made the best speed that we could with the weak boilers we had in the ship. We were in ignorance of what sort of a reception we would have on arrival and thought the Spanish authorities might try to keep us out; but I know that Cushing intended to force an entrance into the harbor even if it was necessary to bombard the entrance forts. The battery was loaded, men at quarters for action and everything ready in case of trouble. The Cuban

pilot was told if he played any tricks he would be shot. On our arrival at anchorage off the city, the English man-of-war *Niobe* was there. She had been there two days. Cushing found that the English captain had not been able to get any satisfaction from the governor and was being put off with the usual Spanish tactics, with all sorts of excuses and delays. On Cushing asking for an audience with the governor the same method was used. Cushing then sent word to the governor that if he did not see him by a certain date, and if any more prisoners were executed, as they threatened to do, he would open fire on the governor's palace. This brought things to a crisis, and a time was appointed for his reception. We gave the authorities evidence that we meant business the first night of our stay in the harbor, by spiking chain cable on outside of hull opposite engines and boilers, cleared ship for action, rigged boarding nettings at night with a full watch on, and kept our pivot guns trained on vessels nearest us. In all verbal communications I think Cushing took the lead, and I think most of the demands originated with him. The demands made were that no more prisoners should be executed and that both commanding officers should be allowed to see all the prisoners remaining. There were no more executions. During our stay, until Braine came down in the *Juniata*, we had not a single word from outside of Santiago, and we did not know if war had been declared or what arrangements the government was making. A French gun-boat came in and her commanding officer could not get any satisfaction from the Governor. I believe he did not even see him. The Frenchman came on board to consult Cushing and told him his troubles. He asked Cushing what he must do. Cushing replied "Bombard the palace or go back to Martinique." The Frenchman's reply was "I will let you do the bombarding, and I will return to Martinique," which he did. The American vice-consul kept us informed of everything that was going on, even in the palace. Plans were made to release and bring on board the prisoners at night, as the prison was not far from the landing, and I think there would have been an attempt made if Braine had not arrived. I think also the Spaniards had an idea that something like that might be done as they kept a strong patrol along the sea-front. Of course the arrival of the *Juniata* and *Kansas* took the case out of Cushing's hands, as Braine was his senior, but by that time things had been pretty well settled and the Spanish authorities forcibly impressed by Cushing. One day Cushing was informed by the vice-consul that there had been a council held by the governor and naval officers to see how prisoners could be gotten away from Santiago. The naval officers had a wholesome horror of Cushing, and only one offered to do it, but only in case he could get a good start ahead of the *Wyoming*.

REPORT OF COMMANDER CUSHING TO THE SECRETARY OF THE NAVY
RECEIVED DEC. 2, 1873.

(Original handed to the Secretary of State by the Secretary of the Navy, December 2, 1873.)

UNITED STATES CONSULATE, SANTIAGO DE CUBA, NOV. 16, 1873.

SIR: As a steamer is unexpectedly about to leave here for Havana in an hour's time, I write this at the Consulate, as I have not time to go off

to the ship and do so. I left Aspinwall on the morning of the 11th instant, in consequence of urgent telegrams from the United States vice-consul at Santiago. He represented the urgent need of a man-of-war, and had received no answer to his dispatches to the consul-general in Havana. He described the shooting of the captain and a large portion of the crew of the *Virginius*, and said that more American lives were in immediate peril. I deemed it my duty, therefore, to take the responsibility of coming here.

The trial took place before a drum-head court-martial, ordered by the commanding general of this department, and fifty-three men were summarily shot.

There are more in prison who are subject to the same fate if tried. Our vice-consul was treated with great disrespect by the Spanish general when he made his protest. I enclose, herewith, a copy of letter that I have to-day sent to the commanding general. I will send all correspondence by the next opportunity. The court-martial and shooting were authorized at the sole responsibility of the general to whom I have written. The British steamer *Niobe* is here, and has demanded that none of the British citizens who are imprisoned shall be executed until the whole matter is investigated by the higher powers.

I shall await the orders of the Department, and protect American citizens in the best manner that is possible. I do not think that any more of the *Virginius*' crew will be executed at present, or that the court-martial will try them until orders are received from Havana. I will write by the regular steamer leaving two days hence, and give a detailed account of matters, and my full reasons for coming, enclosing the telegrams received at Aspinwall that induced me to leave there. Our vice-consul has sorely needed backing, and has sent complaints to the consul-general at Havana regarding the insulting letters and personal behavior of the general who commands this district, in answer to his proper official protests against the barbarous order of the general to treat the crew of the *Virginius* as pirates. When this matter is over we can return to Aspinwall, as we left some important matters there unsettled. (Signed.) W. B. CUSHING.

A few days later the U. S. S. *Juniata* arrived commanded by Commander D. L. Braine, the same officer who once before had relieved Cushing at Smithville, N. C., in January, 1865, and Cushing sailed away from Santiago—having discharged his duty well, for which he received the commendation of a Committee of Congress.

HOUSE OF REPRESENTATIVES—REPORT NO. 781. 43D CONGRESS. 1ST SESSION.

SIR LAMBTON LORRAINE.

June 22, 1874.—Laid upon the table and ordered to be printed.

Mr. Orth, from the Committee on Foreign Affairs, submitted the following report: To accompany joint resolution H. Res. 88.

The Committee on Foreign Affairs, to whom was referred the joint resolution (H. Res. 88) tendering the thanks of Congress to Sir Lambton Lorraine, of the British Navy, have had the same under consideration, and report:

The joint resolution provides:

> That the thanks of Congress are eminently due, and are hereby tendered, to Sir Lambton Lorraine, commander of the British frigate *Niobe*, for his humane and generous interposition at Santiago de Cuba in protecting the lives of the survivors of the *Virginius* expedition. The American people recognize with admiration and gratitude his prompt and emphatic admonition which aided to arrest the progress of butchery, and so long as heroism in defense of humanity is deemed worthy of honor, the name of the gallant officer should he cherished.

In examining the history of the transaction referred to in said resolution, your committee find that the steamer *Virginius* was captured on the high seas by the Spanish man-of-war *Tornado* on the 31st day of October, 1873, and immedately thereafter by the said man-of-war taken into the Spanish port of Santiago de Cuba.

That a few days thereafter, on or about the 4th day of November, 1873, and before sufficient time had elapsed for the interposition of foreign powers, four of the persons found on board of the *Virginius* at the time of her capture were tried, convicted, and executed under the Spanish authorities in the island of Cuba. That neither of the four persons thus executed were citizens of the United States, three of them being subjects of Spain and the fourth a subject of Great Britain. That three days after the execution aforesaid, to wit, on the 7th day of November, 1873, the British war steamer *Niobe*, in command of Lorraine, arrived at Santiago, and on the following day he (Lorraine) held an interview with the Spanish general, Burriel, and made an urgent appeal in behalf of the lives of the British subjects until such time as he should be able to present certain considerations in support of the position he had assumed with reference to the British subjects on board the *Virginius*, all of which appear more fully in the following letter of Lorraine to Burriel, dated November 9, 1873:

* * * * * * * * * * *

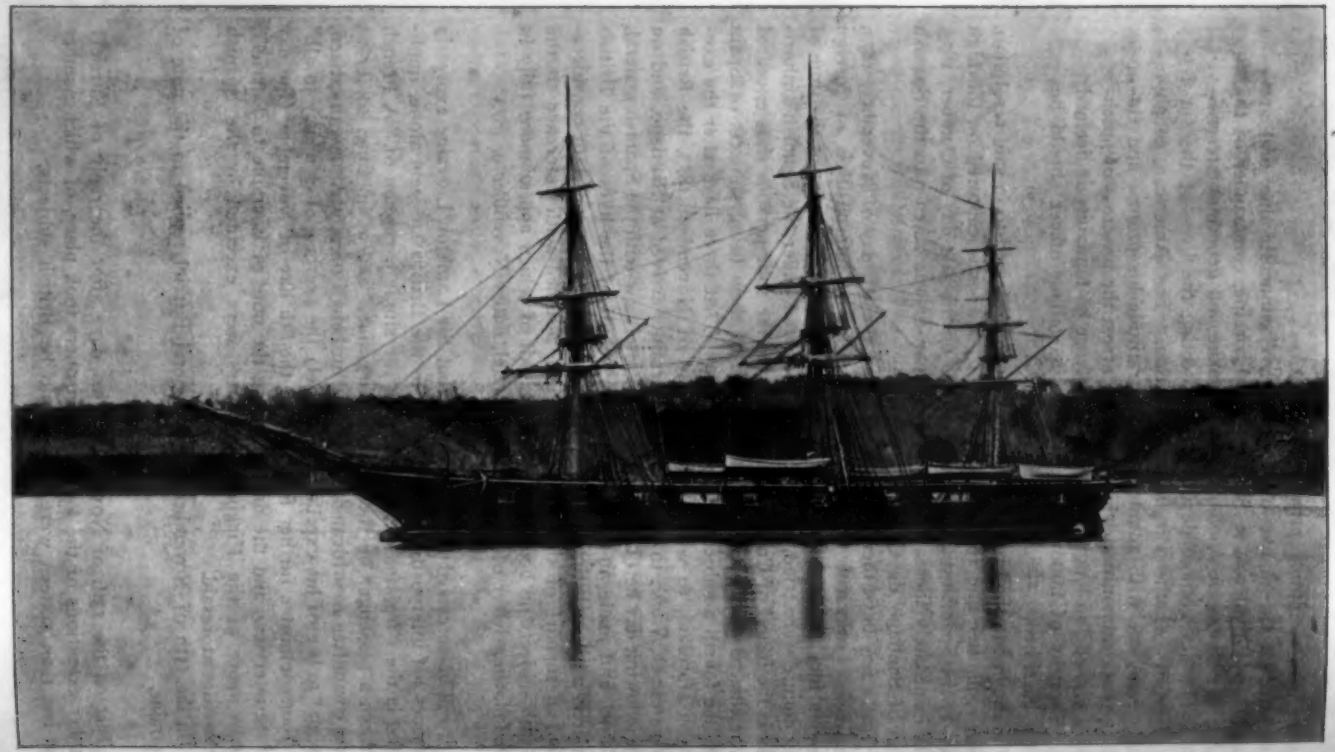
It will be perceived from this letter that Sir Lambton Lorraine expressly confines his interposition and request to the British subjects alone, implicated in the *Virginius* expedition, with the single exception of "A French subject, a passenger on the steamer *Virginius*," and at no time, so far as your committee is informed, interposed in behalf of any American citizen, except "to beg of his excellency (Burriel) the exercise of clemency to all."

Your committee further find that on the 8th day of November (the day of the interview, and the day preceding the note of Lorraine to Burriel), twelve more of the *Virginius* prisoners were executed by the Spanish authorities aforesaid.

On the 11th of November, 1873, General Burriel replied to the note of Lorraine.

* * * * * * * * * * *

That on the 13th of November (two days after the reply of Burriel) farther executions of the *Virginius* prisoners took place, of which number not less than sixteen were reported to be British subjects.



UNITED STATES STEAMER WYOMING.
Commanded by Cushing from July 11, 1873, to April 24, 1874.

That on the night of the 15th of November, 1873, the United States steamer *Wyoming*, Capt. W. B. Cushing, arrived at Santiago de Cuba, and on the morning of the 16th of November he addressed to General Burriel, in the name of the United States, a firm protest.

* * * * * * * * * * *

The committee append the entire note of Captain Cushing to General Burriel, from which it fully appears that Captain Cushing did his duty completely and gallantly in asserting the rights of the American Government and its citizens, and upholding the honor of the American flag.

UNITED STATES STEAMER "WYOMING," SANTIAGO DE CUBA,
November 16, 1873.

SIR: I have the honor to address you this communication regarding the capture on the high seas of the United States merchant-steamer *Virginius*, and the events succeeding such capture. From an inspection of the official books at the United States consulate at Kingston, Jamaica, I find that the *Virginius* cleared from that port for Port Limon on the 3d day of October, 1873. Her sailing-papers, including register and all necessary documents coming under the supervision of the United States consulate, were all certified by the proper authorities. She sailed in ballast, but took out sixty-four haversacks. On the 31st day of October this vessel was pursued and captured something like seventy miles from Cuba.

The *Virginius* has now been sent to Havana to the jurisdiction of the court of admiralty. The question of the lawfulness of this capture on the high seas and out of the jurisdiction of Cuban or Spanish authority is one to be decided, first, by the courts of the captor, after which, if which (sic), if the decision is not in conformity with the accepted custom and laws of nations, the United States Government may reclaim the vessel. The rule of international law in such a case is as follows: "The jurisdiction of the court of the capturing nation is conclusive upon the question of property in the captured thing: its sentence forecloses all controversy respecting the validity of the capture, as between claimants and captor and those claiming under them, and terminates all ordinary judicial inquiry upon the subject-matter. But where the responsibility of the captor ceases, that of the state begins. It is responsible to other states for the acts of the captors under its commission, the moment these acts are confirmed by the definite sentence of the tribunals which it has appointed to determine the validity of captures in war." I, therefore, content myself with making protest, on behalf of the nation that I represent, and shall leave that subject to the determination of the laws that are sure to follow it and reach it. In reading the correspondence between your excellency and the consul of the United States in regard to this matter, I see that your excellency repeatedly terms the *Virginius* a pirate. I must respectfully insist that the *Virginius* was in no sense a pirate. The definition of the word pirate in standard works on international law, and by the general agreement of civilized nations from ancient to modern times, is, that of a vessel committing the offense of depredating on the high seas without being authorized by any sovereign state. "Pirates being the common enemies of all man-

UNITED STATES STEAMER WYOMING.
Commanded by Cushing from July 11, 1873, to April 24, 1874.

kind," such a vessel may be captured on the high seas by the armed vessels of any nation, and taken into port for trial under the jurisdiction of its tribunals. Piracy, under the law of nations, may be tried and punished by the courts of justice of any nation, by whomsoever or wheresoever committed; but piracy committed by municipal statute can only be tried by that state within whose territorial jurisdiction and on board of whose vessels it was committed. So far from being a pirate, as defined by international law, the *Virginius*, if offending at all, was simply a neutral vessel carrying contraband of war, "a blockade runner," or at most a smuggler. She was unarmed, and was lawfully furnished with sea papers, entitling her to navigate the high seas in safety from all men. If attempting to enter a port that was closed by proper authority, and so watched by armed vessels of the state approached that it in fact became a blockaded port, a vessel of a neutral country might, under the laws and agreement of nations, attempt to carry in arms and any contraband of war, subject only to the penalty of capture in transit and confiscation of ship and cargo. No other punishment is permitted by the universal law of nations, to which each individual state must consent. A sovereign state, through its commissioned agents, violating or exceeding such laws, brings itself, not only into serious complications with the nation whose flag and authority the captured vessel bore on the high seas, but it also comes directly in hostile contact with the agreed laws and customs of all civilized nations.

Such, I do not hesitate to affirm respectfully to your excellency, is the basis upon which I question the summary trial, conviction, and execution of the captain of the *Virginius* and all citizens of the United States of America who belonged to his crew. In the eye of the nations of the earth and their well-defined laws, sanctioned by the tests and trials of centuries, such trial and execution is simply murder. I earnestly protest in the name of my country against what has been done, nothing doubting but that the Government of the United States will know how and when to protect its honor. I solemnly protest against the imprisonment or other punishment of any of the living members of the crew or passengers who are either born or naturalized citizens of the United States. I request your excellency earnestly to cease these executions, which must lead to most serious complication. I shall send a copy of this letter to my Government at my earliest convenience, and I respectfully request you to send a copy to his excellency the captain-general at Havana.

Very respectfully, etc.,

W. B. CUSHING,

Your committee are pleased to have it in their power to add that no further executions took place after the reception of this letter by General Burriel.

In view of these facts, your committee believe that said joint resolution ought not to pass; and they report accordingly to the House, and ask to be discharged from the further consideration of the subject.

FROM THE ANNUAL REPORT OF THE SECRETARY OF THE NAVY ON THE OPERATIONS OF THE DEPARTMENT, 1874, PAGES 9 AND 10.

The North Atlantic Station.—At the date of the last report the whole available force of the Navy which could be put afloat on the Atlantic Ocean was under orders to re-enforce this station. In addition to the regular force as stated in the last report, every available wooden and ironclad ship in ordinary was dispatched as rapidly as it could be put in order and properly manned and organized. The *Lancaster* and the *Ticonderoga* were recalled from the South Atlantic, and the whole European fleet from the Mediterranean, and ordered to concentrate at Key West. The force thus concentrated in the station consisted of the *Franklin, Minnesota, Wabash, Canandaigua, Shenandoah, Juniata, Ossipee, Wachusett, Powhatan, Wyoming, Kansas, Shawmut, Saugus, Mahopac, Manhattan, Ajax, Canonicus, Dictator, Despatch, Pinta, Fortune,* and *Mayflower,* and Rear-Admiral Case, as senior officer present, assumed command, in pursuance of orders to that effect, January 3, 1874, the date of his arrival at Key West. Rear-Admiral Scott remained in command of a division.

The causes which led to this concentration of force were generally and briefly alluded to in my last report, and it may now be proper, in order to complete the record of the action of the Navy in connection with the *Virginius* affair, to recite the more prominent of the proceedings in relation thereto in which it took part.

Commander Cushing, of the *Wyoming,* upon receiving information, through dispatches from the consul-general of the United States at Havana, of the capture of the *Virginius* and the execution of a part of her crew, very properly sailed immediately from Aspinwall, where he was then stationed, to Santiago de Cuba, arriving there on the 16th of November. He put himself at once in communication with the authorities of the port, and protested against the further execution of prisoners of the *Virginius.* In the meantime the *Kansas,* Commander Reed, and the *Juniata,* Commander Braine, then at New York, had been instructed to proceed to Santiago de Cuba for the purpose of inquiring into all the circumstances connected with the capture of the *Virginius* and the execution of members of her crew. The former sailed from New York November 14, and the latter November 19. The *Juniata* reached Santiago de Cuba November 26, and the *Kansas,* meeting with severe weather, did not arrive until December 2. Commander Braine, the senior officer present, entered a protest against the further execution of prisoners of the *Virginius,* and took every means in his power to encourage them and conduce to their comfort. The Department's instructions were judiciously complied with. In carrying out the provisions of the protocol of December 8, the *Juniata* was instructed to receive on board the survivors of the *Virginius,* provide them with comfortable accommodations and convey them to the United States. These survivors, one hundred and two in number, were so received December 18, and safely landed at New York on the 28th of the same month. As another provision of the protocol contemplated the saluting of the American flag at Santiago de Cuba on the 25th day of December, 1873, and the *Canandaigua,* Captain Lowry, was dispatched to

that port to be present when the salute should be given, and to return it. She left the capes of the Delaware, December 12, and reached her destination December 19. This ceremony having by subsequent arrangement been waived, she remained at Santiago de Cuba until January.

In fulfillment of a third condition of the protocol, viz, the delivery of the *Virginius* at Bahia Honda to a war-vessel of the United States, on the 16th of December the *Despatch* was sent to that place for the purpose of receiving her. Captain Whiting, chief-of-staff of the North Atlantic fleet, was intrusted with this duty. The *Virginius* was received at the point and on the day mentioned, provided with a suitable crew, and convoyed to the Tortugas. Here she was placed under convoy of the *Ossipee*, and dispatched to the north. Unfortunately, but unavoidably, in view of her condition and of the fact that she encountered heavy weather, the united efforts of her convoy and of the officers and crew which had been put on board of her were unavailing to save her from the dangers incident to a winter passage on our coast, and she foundered off Cape Hatteras, on her passage to New York. The several officers to whom were intrusted duties of this delicate nature, touching the settlement of an important international question, were instructed to clothe, in carrying out their orders, the firmness required with the utmost courtesy in their intercourse with the officers, both ashore and afloat, with whom they might be brought in contact, and these conditions were studiously observed in every particular.

LETTER FROM LIEUTENANT-COMMANDER CUSHING, U. S. NAVY, TO MASTER PILLSBURY, U. S. NAVY, ON THE U. S. S. "COLORADO," ASIATIC STATION.

NAVY YARD, BOSTON, MASS., April 18, 1871.

DEAR COUSIN ELLIOT: As I suppose that you would not object to a little Navy and Boston gossip, and as I should be much interested in any news from my late cruising ground, I am going to write, with a hope that you will fire back as soon as convenient. I am still in the ordnance here—the senior Lt. Comdr. in the yard—and still eight files from my coveted promotion to the third stripe.

Nearly all the officers have been changed here this winter. Capt. Parker was relieved by Capt. Bryson, and Capt. Hughes has the *Ohio*. Potter has been sent to sea in command of a 4th rate, much to his disgust. Kautz is still here and elated by the proprietorship of a boy baby.

Walker and Nichols are with Spicer in the Equipment, and the Ordnance, headed by Truxtun, is kept alive by B. P. Smith, Schouler and myself.

It is exceedingly dull at the yard, and we have nothing to do but doze in our office chairs, and swear at "Dull Time."

The Armory is turned into a ball room every Tuesday, and quite filled with the yard and city belles and beaux. The floors are waxed, and the Marine Band furnishes the music.

I have been absent all winter, on leave, in Washington, where I had a very gay time amidst balls, parties and receptions.

I had a good time with Milton for the first time in five years, and satisfied myself that he could beat me at billiards. He has been ordered on the practice cruise, and joins the ship on the first of May.

The "High Commission" and the "Low Commission" (San Do.) are both in session, the first-named being busy with champagne excursions with the jolly Robeson, and the others still in bed, with syphons down their throats, drawing off the West India rum that they have smuggled in.

I am enjoying my quiet married life very much, and am completely domesticated. My bachelor habits have gone to the winds—a great saving of dollars and an improvement in health. We are going out of the city to pass the summer, having taken a suite of rooms in Medford.

I saw your mother, Florence, and Lulu two days since, all well and happy, preparing, I presume, for the coming event that will bring you a brother-in-law.

Remember me to Casey, Picking, and other friends. We hear great stories of the beautiful condition of the *Colorado* and her discipline. I am glad that you are having such a good time, and wish you a pleasant cruise, good health, and a safe return.

Don't get knocked over by those confounded Koreans—its better to be killed by white men.

In haste, affectionately,

(Signed.) W. B. CUSHING.

The brave mother who gave three famous sons to the Union cause was an accomplished woman. A few days before the birth of Howard, Mrs. Cushing was impressed with the presentiment of death and wrote in her Bible three verses under the heading "To Milton, with the Legacy of his Mother's Bible." The last verse is given:

Farewell, my son! Perchance through grace
  We'll meet again above—
Thine infant memory may not trace
Thy mother's form, thy mother's face;
  But O, that mother's love
Burns deep for thee, my first-born child!
God keep thy spirit undefiled!

The mother was highly esteemed by her neighbors as is shown in a newspaper clipping from the *Dodge Co. Citizen*, Beaver Dam, Wisconsin, about December 24, 1864.

In the proceeding of Congress this week we find this item:

On motion of Mr. Rice the House took up and passed the Senate joint resolution, giving the thanks of Congress to Lieut. Cushing for destroying the *Albemarle*.

The destroying of this formidable ram and ironclad was one of the most daring and brilliant adventures of naval warfare, and of course places the name of its hero, Lieut. Wm. B. Cushing, permanently in the annals of fame and makes him a subject of public interest and inquiry.

A few evenings ago a party of citizens of this city, but formerly of Chautauqua County, N. Y., in conversation while taking an oxteam sleigh ride, developed the following reminiscences of Lieut. Cushing's early life. His mother was a widow with three boys, all of them born in Wisconsin, of whom William was the youngest when she settled in Fredonia, Chautauqua Co., N. Y., her husband's native place, for the purpose of giving her sons the best school education she could afford for them. This was about seventeen years ago. She is remembered as a more than usually intelligent lady, cultivated, refined, literary in her tastes, and a faithful and devoted mother. Mrs. F. R. Harris Reid, of this city was then a teacher in the Union School of Fredonia, and Willie Cushing, then about five years old, was the prodigy of the school in the art of "speaking pieces." For a certain exhibition occasion his mother wrote a piece for him and he spoke it, no one but himself and her knowing anything about it till it came out before the audience in his fine graceful delivery, as follows:

Who, with a cheerful, smiling face,
Meets her loved pupils in this place,
  Each morn and never tarries,—
And though the day be wet and cold,
Hastes like a shepherd to his fold?
  Our teacher, good Miss Harris.

Whose dark eye meets each little child,
When fun and frolic, nearly wild,
  Away good order carries?
Who grieves to punish, when she must,
And even then is kind and just?
  Our teacher, good Miss Harris.

I fear we may not keep her long
Amid our noisy little throng;
  But blest is he who marries
The patient, kind, devoted girl—
A precious gem, a priceless pearl—
  Our dear beloved Miss Harris.

A certain well-known citizen, a widower, who, Madame Rumor said, was going to marry Miss Harris, was there present, and this last bit set all eyes on him and made uproarious merriment for the audience who wouldn't be satisfied until Willie came out and spoke his piece over again. (But the *lucky man* wasn't there—Ed. Citizen.)

There are probably twenty or more people in this city and vicinity, from Chautauqua County, N. Y., who remember the widow Cushing and her three little boys, and will recall some of the above facts. Her oldest son, Alonzo, was captain of a battery in the terrible battle of Gettysburg, and refused to retreat after three separate orders to do so from his superior officer: he held his ground, kept his battery playing on the rebels, won the

distinction of having saved the day, but fell at his post of valorous duty and bloody victory. These boys were noted in their school days for pluck and energy, and were always on hand *to fight* for their own and each other's rights, or for any small or feeble child that might be imposed upon by stouter children.

Mrs. Cushing has left on record her own comments on the boyhood of her gallant son William, stating that he was always fond of the water, and a swimmer in babyhood; from a small bridge near the Cushings' Wisconsin home one might have seen any summer day four small images spring into the water, as the brothers were loving, healthy little companions in all their sports. There Will's life was saved from drowning by an elder brother. In Chicago Will took his father's tall hat, slipped away unnoticed, and walked from a pier into the river. After frantic search his parents found him sleeping quietly in the bed of the good wife of the sailor who had rescued him from a watery grave. "The wiver went, and the steamboat went, and I went too," was his explanation of the mishap.

The mother says: "My boys were all fearless, but Will was particularly daring: impatient of restraint but easily governed through his affections; very truthful, loving and sympathetic; quick to feel and prompt to act."

Cushing was a kindly and courteous man in his relations with brother officers and was particularly considerate of youngsters and newly-fledged appointees. A chaplain of the navy tells: "When I received my appointment in the navy a friend gave me a letter of introduction to Commander Cushing, then stationed at the navy yard where I was ordered to report. Arriving at the yard I inquired for Cushing and was informed that he was sitting on a court in a certain building. I proceeded to the building, and found a sentry in the corridor and asked him to take my card to Commander Cushing. He disappeared through a door, soon returned and ushered me into a large room where fourteen officers in full dress sat about a large table. A large man with beetling eye-brows and a great voice demanded "What have you to say to the Court?" I blushed and stammered out, "I would like to see Commander Cushing." The large man, whom I later learned was Commodore Pattison (pronounced *Pat-eye-son* with accent on the *eye*)," said "Commander Cushing this gentleman wishes to speak to you."

Cushing obtained permission to withdraw from the room and spent a few minutes with me in the corridor, kindly explaining that it was impracticable for him to leave the court for long and fixing a time when he would be at leisure. It was my first glimpse of a general court-martial and of Cushing. I shall always retain a strong impression of the courtesy of this man, and also of his keen, bright eye, his animated face, his general appearance of vigor and alertness."

In personal appearance Cushing was attractive and striking, six feet tall, slender and perfectly erect. He said that to this last fact he owed his life at the *Albemarle* affair when a Confederate shot passed close to his spine carrying away the coat and the buttons at the small of his back. His undershirt torn by a grape shot is in a museum in Washington. He carried his head high and shoulders well thrown back which gave him a decidedly military air, and yet he was easy and graceful in his movements which indicated great strength and force. His features were regular and finely cut; his eyes were light blue-grey, but his animation and enthusiasm in conversation rendered them darker in appearance. His hair was medium dark brown, soft and straight, and he wore it long; the mustache of a lighter shade, delicate and silky. He was a good son, husband and father, religious in thought and sentiment, a firm believer in prayer, having received unmistakable proofs of its efficacy in his own experiences. He had faced death many times and he wondered, as a man will, as to what his end would be. His mind rendered him a good companion. He talked well and wrote well. His impulses were fine, noble, courageous. Cushing met, as a bridesmaid at his sister's wedding, in 1867, the charming girl who became his wife at Fredonia, N. Y., in February, 1870, after his return from the *Maumee* and Chinese waters. He always brought home gifts from his cruises. His wedding, attended by many naval officers in uniform, is said to hold the record for the largest clergyman's marriage fee in Fredonia. The bride, Miss Katherine Louise, daughter of Brigadier General David S. Forbes, became a very happy Mrs. Cushing, and she still resides in her childhood home where were born her two daughters, Marie Louise, and Katherine Abell. Just after his marriage, Cushing was ordered to ordnance duty at the Boston Navy Yard, and he greatly enjoyed his first shore duty. He was domestic in his

tastes, made many social calls with his wife, and brought some present home at every opportunity. He was an unusual husband in keeping his wife supplied with more hats and finery than she wanted, and he issued orders that she must always have in her wardrobe a silk gown of a certain shade of blue, the color of the dress she had worn at the time of their engagement in 1867. He was a fluent reader, and fond of Thackeray, Dickens, Tennyson, classics and poesy, which he delighted to read aloud as his wife was busy with sewing or other household tasks. Their first housekeeping was in a little six-room house in the Washington Navy Yard, which he furnished and where he welcomed his wife with babies and nurse to a dinner ready to serve. He enjoyed a busy life, but spent much of his leisure with his wife driving with horse and surrey, enjoying the babies' prattle and all the joys of home. His mother came for a visit in the early fall, of 1874, that dear mother who had been father and mother to him since he was four years old. The first money that he earned as a page he sent to her asking that she buy herself a silk dress. He purchased with his first prize money a home and presented it to her together with $5000 in bank. A portion of his pay was allotted to her support. The proud mother enjoyed Washington and her famous son and charming daughter. Together they enjoyed the thanksgiving sermon of Dr. Newman and a genuine New England turkey dinner. A few days later, an acute attack of sciatica was treated by injections of morphine. A violent mental shock was caused by a brother's misfortune and in his weakened condition the delirium of brain fever followed. In his crowded quarters was little room for a delirious patient and he was taken to the Government Hospital for the Insane, on December 8, 1874, where he could have good care and nursing. His wife and mother were with him, on December 17, when he became conscious and rational, and recognized those about him. While repeating the Lord's Prayer, his voice wavered, and stopped; the gallant spirit was gone, the brave heart still.

Cushing's ashes lie on Bluff Point in the U. S. Naval Academy Cemetery. Within a few feet of his handsome monument lie his friend and commander, Lieutenant-Commander Charles W. Flusser, killed in midnight battle with the *Albemarle*, and another friend and companion in arms who fell in the deadly assault on

Fort Fisher, Lieutenant Samuel W. Preston. He could have chosen no fitter place for his final rest, no better companions for the deep sleep of death.

CUSHING'S TOMB ON BLUFF POINT, NAVAL ACADEMY CEMETERY.

ORDER.

NAVY DEPARTMENT, WASHINGTON, December 18, 1874.

The Secretary of the Navy regrets to announce the death, in this city, at 2.30 p. m., on the 17th instant, of Commander William B. Cushing, of the Navy, an officer of merit and ability, who was distinguished for many acts of daring and courage during the late war.

His funeral will take place on Sunday, the 20th instant, at 2 p. m., from the Commandant's quarters, Navy Yard, Washington.

The Officers of the Navy and Marine Corps are requested to attend in full undress uniform.

GEO. M. ROBESON,
Secretary of the Navy.

The two letters following are given to show Cushing's accuracy of observation just twenty days before his death; and the high approval accorded him by Mr. Gideon Welles. It is fair to say that "Albemarle Cushing" was brave and true, and that he was a man of imagination, sympathy, hope, faith and love.

EXTRACT FROM LETTER, NOVEMBER 27, 1874, FROM COMMANDER CUSHING TO HIS BROTHER.

Thanksgiving has been made, and the day is passed as Mother has probably described in her letter mailed this morning. Mother was delighted with the sermon, her ride to "Stewart's Castle" (as they call it), and other fine buildings, and our visit to Corcoran's Gallery of Art. I was intensely interested, as I had never been there. I was perfectly amazed at the treasures of art that this man has bestowed on this fortunate city. We returned home with rabid appetites for our 5.30 Thanksgiving dinner. Grant came in late to church and sat in the end of the pew next to us—not twelve feet away on my left. I caught his eye once, and he looked me square in the face for about ten seconds, as if he had thought that he had seen me before. I looked with a perfectly impassive face, wondered how thick his neck looked, and how his cheeks were puffed out. He was dressed very plainly, and had on a brown overcoat with velvet collar.

Cox will come into the new Congress a year from next Tuesday with 79 majority of Democrats and Independents, and majority enough on a joint vote to do anything. No more two-thirds or three-fourths majority for the Republican party. Cox is friendly, and I am on no side at all. Rid us of Robeson and I am content. May the party that accepts new and necessary issues win, and may they all cuff each other heartily for supremacy in our next Presidential Election.

LETTER FROM GIDEON WELLES TO MR. E. P. DORR, OF BUFFALO, N. Y.

E. P. Dorr, Esq. HARTFORD, 17th Feby., 1876.

DEAR SIR: I have your letter of the 14th inst., and am glad to learn you are preparing a paper for the Historical Society of Buffalo on the services of the late Lieut. Wm. B. Cushing. You ask me to send such reminiscence as I may call to mind of that young hero which are not matters of record. His brief, adventurous and heroic achievements furnish some of the brightest pages in our naval annals, and my recollections of him are identified with them. Many who knew him not personally, and some who did, fail to appreciate his extraordinary traits of character, and impute his acts of heroic daring to wild and inconsiderate recklessness, but there was in his dashing exploits, not only audacity and intrepid courage, but wonderful sagacity and prudence. Projects which most persons deemed wild and inconsiderate will be found on investigation to have been deliberate and well planned designs, and the results, whether in overcoming or putting to flight superior numbers, naval and military, in lower Virginia, hazardous enterprises in the sounds and rivers of North Carolina, or in the destruction of the ironclad steamer *Albemarle*, demonstrate the wisdom and intelligence which prompted, no less than the courage of the young officer in every instance.

I first saw young Cushing soon after entering upon my duties as Secretary of the Navy. He had just been dismissed from the Naval Academy for reasons which his kinsman, Admiral Joseph Smith, pronounced scholastic rather than naval,—not essential to his profession, and wholly

insufficient to justify such severe treatment. But the Superintendent Captain Blake, and Captain Magruder, Chief of the Ordnance Bureau, who had special charge of the School at Annapolis, declared it was not his first failure, that he was inattentive to certain studies, was boyish and wayward, was wanting in essential elements which were requisite to the make-up of a good naval officer, and that to reinstate him at the Academy would be detrimental. Under the emphatic protest and remonstrance of these officers, he could not well be restored, but I well remember the expression of saddened disappointment and grief which shadowed his juvenile face when informed of the fact.

A few weeks later, when hostilities commenced, he promptly applied for permission to re-enter the Navy, said his passion and his life were in it, and that in some capacity he was determined to live and die in the profession. In the emergency of that period, but without legal authority to act, for Congress had adjourned without investing the Executive with any discretionary power to meet the impending crisis, it became necessary to immediately increase the naval force, and, one of the earliest appointments I made, was that of young Cushing. Sympathy for the youth, whose perseverance, enthusiasm and zeal impressed me, had probably as much influence as the recommendations of his friends in this selection. His gratitude for the appointment was earnest. He said he considered it his first step; that he would gain position, and I should never have cause to regret his re-instatement in the service.

The reports and anticipations of Commodore Stringham, under whom he first served, were scarcely more favorable than Blake's and Magruder's. He thought Cushing too full of levity, too fond of fun and frolic to make a valuable officer. The truth was with his exuberant spirit he had too little to do; his restless, active mind was filled with adventure and zeal to accomplish something that would do himself credit and the country service.

Your paper will, if I understand you, make mention of his bold, skilful and successful exploits, most of which will be found in his own reports, and the reports of his superior officers. I need not, therefore, allude to them further than to say, they were unsurpassed, I think unequaled in number, conception, plan, and courageous execution by those of any officer under the government. Our navy was filled with brave men, ready to do or die, but the youthful Cushing was personally without a rival in prolific schemes, important in their results, and in the hazardous and daring execution of which he always chose to lead. The very audacity of many of his suggestions startled and astounded those to whom they were communicated, but when accepted and accomplished, they extorted admiration.

The official reports of his exploits are interesting, but a narrative of the details, would they be told, would be found to equal those of wild romance.

Possessing the happy faculty of magnetizing and inspiring others, he never failed to procure an abundance of volunteers for his most hazardous expeditions. Foremost in all danger, his men were ever ready to follow, relying on his ready tact, courage, and ability. Notwithstanding his juvenile looks and manner, their confidence in him was unlimited.

In the spring and summer of 1864 great anxiety was felt in relation to affairs on the coast and in the sounds of North Carolina. Most of the troops had been withdrawn for service elsewhere, leaving but a feeble force to retain and occupy the places in our possession. The fleet which had co-operated with the army was composed, necessarily, of light-draft vessels, for such only could enter and navigate the sound. These seemed at the mercy of the *Albemarle*, a formidable ironclad steamer, which had been built on the upper waters of the Roanoke for their destruction. Though this powerful craft had been bravely met, and to some extent injured by our unarmored vessels, several had been sunk or disabled by her, and others remained in constant apprehension of the reappearance of their formidable antagonist.

While the government, and especially the Navy Department, were in extreme solicitude for the welfare and safety of the force, naval and military, in that quarter, young Cushing was permitted, in July, to come to Washington and submit a proposition by which, if the Department approved, he would destroy the *Albemarle*. He was at that time only twenty-one years of age, with a youthful, almost boyish look and appearance, such as would have prevented his proposition from being entertained but for the ability he had exhibited on repeated occasions, and the reputation he had already acquired for daring and successful achievements. In fact, he came to me fresh from the execution of a remarkably bold and hazardous reconnoissance of the harbor and entrance of Wilmington. His earnestness, undoubted courage and the skill and judgment exhibited on repeated occasions inspired me with confidence in him and his project, notwithstanding his youth.

I therefore gave him confidential orders to proceed to New York and report to Admiral Gregory, who on the 7th of August was instructed to "fit out as early as practicable two of the picket boats for Lieut. Wm. B. Cushing." The boats were furnished him, with torpedoes prepared by Chief Engineer Wood. With one of them he reached the sounds of North Carolina, proceeded up the river and sunk the *Albemarle* at the wharf where she was trebly guarded.

This bold and unexampled exploit, be it remembered, was planned and executed by this young officer without adventitious aid or previous training. The government had, at that time, no torpedo station, had not expended millions in experiments and in training its officers for torpedo service. Unsuccessful attempts, and in different ways, had been previously made to do a work which this young officer alone devised and accomplished.

It has not been my purpose, nor does it seem the object of your enquiry, that I should specify or detail the adventures of Cushing. Circumstances connected with his entrance into the service and some of his intercourse with the Department that are not generally known, but which develop his traits, are mentioned. I may add that the great chief of the American Navy, Farragut, who was endowed with like heroism, and for whom *alone*, the office of admiral was created and its honors intended, said to me that while no navy had braver or better officers than ours, young Cushing was the hero of the War.

Very respectfully,

(Signed) GIDEON WELLES.

DETAIL CHRONOLOGY OF WILLIAM BARKER CUSHING.

Nov. 4, 1842, Born in Delafield, Wisconsin.

Sept. 25, 1857, appointed acting midshipman from New York.

Mar. 23, 1861, resigned.

April 1, 1861, appointed acting master's mate in the U. S. Volunteer Navy, and served as such attached to the U. S. S. *Minnesota.*

Sept. 13, 1861, resigned, resignation accepted.

Oct. 19, 1861, warranted as a midshipman from June 1, 1861.

Oct. 25, 1861, ordered to duty in North Atlantic Blockading Squadron and assigned to the U. S. S. *Cambridge.*

Nov. 9, 1861, with Lieutenant William Gwin destroyed the *Ada* in Rappahannock River.

Mar. 27, 1862, detached from *Cambridge* with sick-leave for one month.

May 14, 1862, ordered to U. S. S. *Minnesota.*

July 16, 1862, promoted to lieutenant.

August —, 1862, ordered to U. S. S. *Commodore* Perry as executive officer under Lieutenant-Commander Charles W. Flusser.

Oct. 3, 1862, in severe engagement in Blackwater River, and for great gallantry was placed in command of the U. S. S. *Ellis* a small steamer captured at Elizabeth City, February 10, 1862, and armed with two 12-pounders and a 100-pdr. Parrott rifle, draft 6 feet.

Oct. 19, 1862, burned laden schooner *Adelaide* in New Topsail Inlet.

Oct. 29, 1862, destroyed large saltworks in New Topsail Inlet.

Nov. 23-25, 1862, expedition to Jacksonville, N. C., and loss of the *Ellis* under guns of enemy's batteries.

Nov. 26, 1862, asked permission to take the schooner *Home* into New Inlet to capture Wilmington pilots. With approval of the Department the attempt was made. On return Cushing was ordered to command the U. S. *Commodore Barney.*

April 11-May 4, 1863, senior officer in charge of squadron of twelve gunboats aided army in defense of Suffolk and saved that post from capture, by his own zeal, skill and courage and those of Lieutenant Lamson.

April 22, 1863, led expedition of ninety sailors over land to Chuckatuck, Va., a punitive expedition.

June 24, 1863, led joint expedition to White House, Va.

Aug. 9, 1863, ordered to command the U. S. S. *Shokokon.*

Aug. 22, 1863, destroyed schooner *Alexander Cooper* in New Topsail Inlet.

Aug. 18, 1863, destroyed the blockade-runner *Hebe.*

Sept. 5, 1863, detached and ordered to command U. S. S. *Monticello.*

Feb. 29, 1864, boat expedition to Smithville to capture the commanding general.

Mar. 6, 1864, the U. S. S. *Monticello* rammed and sunk the U. S. S. *Peterhoff.*

May 9, 1864, proposed attack upon C. S. ram *Raleigh.*

June 23-25, 1864, reconnoissance in Cape Fear River.

July 9, 1864, proposed capture or destruction of C. S. ram *Albemarle.*

Oct. 9, 1864, detached from command of *Monticello.*

Oct. 27, 1864, sunk C. S. ram *Albemarle* by torpedo. Commissioned lieutenant-commander from this date.

Nov. 22, 1864, ordered to North Atlantic Blockading Squadron, and Dec. 2 placed in command of flagship *Malvern*.

Dec. 20, 1864, tendered the Thanks of Congress for skill and gallantry in destroying the C. S. ironclad *Albemarle*. Voted silver medal by Union League of Philadelphia.

Dec. 24, 1864, Buoyed out channel and dragged for torpedoes under the guns of Fort Fisher.

Dec. 25, 1864, sounded along the front of Fort Fisher.

Dec. 27, 1864, ordered to command the U. S. S. *Monticello*, and destroyed blockade-runner under the guns of Fort Caswell.

Jan. 13-15, 1865, bombarded Fort Fisher.

Jan. 15, 1865, led assault on Fort Fisher; collected several hundred sailors and relieved U. S. Army forces in trenches.

Jan. 18, 1865, occupied Fort Caswell and Smithville, hoisted Stars and Stripes, relieved by Lieutenant-Commander Braine.

Jan. 19, 1865, decoyed by range-lights and captured blockade-runners *Stag* and *Charlotte*.

Feb. 4-6, 1865, expeditions to Little River and Shallotte Inlet.

Feb. 10-11, 1865, made night reconnoissances in Cape Fear River to near Wilmington.

Feb. 18, 1865, placed "mock monitor" made of an old flat-boat and canvas near Fort Anderson causing the evacuation of that work.

Feb. 24, 1865, detached from command of *Monticello* and wait orders.

March 20, 1865, admitted to the Third Degree of Free Masonry, Star of Bethlehem Lodge, Chelsea, Massachusetts.

May, 17, 1865, ordered to navy yard, New York.

June 24, 1865, ordered to U. S. S. *Lancaster*, Pacific Station.

March 5, 1866, tendered Freedom of the City of San Francisco.

March 11, 1867, detached and wait orders.

Oct. 7, 1867, ordered to command U. S. S. *Maumee*, sailed from Washington Navy Yard, and via Rio, Cape Town, Crater Lake, and Batavia, arrived at Hong Kong the first of May, most of the journey being under sail. June 13-18, 1868, Nov. 20-Dec. 10, 1868, cruising for Chinese pirates.

Nov. 12, 1869, detached.

Feb. —, 1870, married to Miss Forbes, at Fredonia, N. Y.

Mar. 30, 1870, ordered to ordnance duty, navy yard, Boston.

Jan. 31, 1872, commissioned commander.

Feb. 9, 1872, detached and wait orders.

July 11, 1873, ordered to command U. S. S. *Wyoming*.

Nov. 16, 1873, arrived at Santiago de Cuba, 11 a. m.

Nov. 18, 1873, started fires; at 9 a. m. "shifted berth near in."

Nov. 26, 1873, Commander Braine in the *Juniata* arrived at Santiago, and the *Kansas* arrived on Dec. 2.

Dec. 5, 1873, the *Wyoming* stood out of Santiago and arrived at Key West Dec. 10, departed for Aspinwall Dec. 23, returned to Key West, January 22, 1874, convoying the *General Sherman* seized at Aspinwall;

drilled with the great Fleet in February, and was ordered to the Washington Navy Yard to go out of commission.

April 24, 1874, Cushing was detached on waiting orders.

April 27, 1874, ordered to duty as assistant to executive officer, navy yard, Washington.

August 25, 1874, ordered to duty as senior aid to commandant.

Dec. 8, 1874, transferred to Government Hospital.

Dec. 17, 1874, died at 2.30 p. m.

Dec. 20, 1874, funeral from commandant's quarters navy yard, Washington; interment at Bluff Point, Naval Academy Cemetery, January 8, 1875.

Alonzo Hersford Cushing was graduated from West Point in June, 1861, was ordered to Washington without delay, was assigned to training volunteer artillerymen, as first lieutenant U. S. Artillery, and was in command of Battery A, Fourth Artillery of Regulars at Bull Run. He was assigned to the defenses of the Capital, and became ordnance officer for the Second Corps at General Summer's headquarters, January 21, 1862, and in March was in charge of topographic work. In the "seven days before Richmond" he received high praise from General Sumner and in July was transferred to the Topographical Engineers, the highest branch of the army, and was with McClellan at headquarters. At Antietam he served with his battery. On November 5, McClellan was superseded by Burnside, and with Sumner, Cushing continued as topographer. At Fredericksburg, December 13, 1862, he took position beside General Couch who reported: "Lieutenant Cushing was with me throughout the battle and acted with his well-known gallantry." For this he was brevetted captain by the President. After three weeks leave, from January 26, 1863, Cushing resumed command of his battery and never left it until his death. He gallantly served in the preliminary actions before Chancellorsville, and in that famous battle, and was brevetted major from May 2, 1863. With Hancock's corps and with his battery he moved to Gettysburg; he served with that superb soldier as aid, and on the field was brevetted lieutenant-colonel "for conspicuous gallantry at the battle of Gettysburg, July 1, 1863." The detailed histories of that battle, probably the most important land fight in the history of this nation, give mention of Cushing's endeavors on the second and third days of the deadly struggle.

In the afternoon of July 3, Pickett's splendid column of 17,000 American soldiers emerged from the woods across the valley and moved toward the Union center where Cushing held front place. Confederate cannon fired shell over the infantry with disastrous effects on Union bones and flesh. The enemy came nearer, discharging musketry, and Cushing's battery opened with case and canister. Cushing's shoulder was pierced by a musket-ball, but he continued to serve his battery with double and triple charges of cannister that opened immense gaps in the Confederate lines. Again wounded, this time through the abdomen and both thighs he lay propped up against a wheel, dreadfully ill, frightfully suffering, and directed his gallant orderly sergeant Fuger to stand beside him and transmit his orders to the batteries. The gallant Confederate, Armistead, at the head of his men who had been bunched behind the stone fence just in front of Cushing's battery, leaped the fence, charged the battery. Cushing was instantly killed by a shot through the mouth and brain, and the cry "Cushing is killed" rose over the roar of battle. Armistead was riddled with bullets; the arillerymen fought like demons with pistols, sabers, handspikes, rammers, spokes, fists; and then came the onrush of the Philadelphia Brigade. Armistead's men who did not escape were killed or captured. Pickett's charge was ended, and the flood tide of the Confederacy began to recede never again to attain so great a height. Of Cushing's Battery A, with ninety enlisted men and ninety horses at the beginning of the fight, seven men were killed, thirty-eight wounded; two officers killed and one wounded; eighty three horses killed. Nine ammunition chests were blown up and not an uninjured wheel remained. The behavior of the men of Battery A was due to the training and example of this gallant youth on numerous battlefields. The riddled bodies of Armistead and Cushing lay beside the same piece at the very apex of Pickett's charge; foes in life, companions in death.

Howard Cushing at fourteen became a printer's devil in the office of the *Censor* at Fredonia, obtained employment as a printer in Boston, thence went to Chicago as a typesetter on the *Farmer's Advocate*, and in 1861 raised a volunteer company of newspaper men. He was elected captain, but the Illinois authorities did not accept the company. He enlisted in Battery B, First Illinois Artillery, and served through various campaigns including operations

at Vicksburg. On November 30, 1863, he was made a second lieutenant, U. S. Artillery, and assigned to Battery A, Fourth Artillery in which Alonzo had served so well, and with the brave former Sergeant, Fuger, promoted for his gallantry at Gettysburg, Howard took part in many battles of the Army of the Potomac, until May, 1864, when the battery was ordered to Washington to recuperate. On July 9, 1864, he was in the battle of Monocacy, and thence moved to Fort Totten, near Bladensburg, to defend Washington against the raid of General Early. On July 12 the Confederate attack was opposed by Battery A with its three 100-pounder Parrotts. Late in the fall Cushing was sent with his battery to guard the prison at Elmira, N. Y., containing some 12,000 confederate prisoners. Here he restored discipline and maintained order. Cushing was with the Heavy Artillery at Fort Myer, until September 7, 1867, when he was, at his request, transferred as second lieutenant to Troop F, Third Cavalry, and three months later became first lieutenant. Cushing was the pride and boast of his troop, and his courage and deeds are recounted in part in the story of the Third Cavalry, and in a charming volume "On the Border with Crook." In 1869 he drove the Indians in Western Texas. In 1870, after a cruel Indian massacre of a party of thirty whites, he surprised and destroyed almost to a man the offending Indians. Cochise, the predecessor of Geronimo, was the wily Apache chief whom the government coddled in the army camp in the winter of 1870-71, against Cushing's earnest protests. In May, 1871, Cochise went on the war-path and Cushing, on May 5, was at Bear Spring in Whetstone Mountains, Arizona, with a reconnoitering party of twenty-two men. With three of his men, separated from his party, he was ambushed and slain. There was great rejoicing amongst the hostile tribes of New Mexico and Arizona over Cushing's death. Mr. Sylvester Maury wrote of him "He was a *beau sabreur,* an unrelenting fighter; and although the Indians have got him at last, he sent before him a long procession of them to open his path to the undiscovered country."

William Cushing wrote, in part, from Boston to his brother Milton on May 15, 1871:

MY ONLY AND VERY DEAR BROTHER: With a heart full of agony I write to you of our terrible misfortune. Dear, brave "Howie" is no more. I saw the news in the paper at 8 a. m. in the country this morning and hastened in to break it to mother. *Poor dear* little Ma! Her heart is almost broken. Oh *dear* old fellow—we are left alone now—the last of

four: and let us swear to stand by each other and our noble Mother in all things.

Dear old fellow—we must be doubly loving and attentive to little Ma now. Write often to her. One thing is certain of her sons: they cannot be beaten. You can kill but not conquer them.

A beautiful tribute was paid to Lon by the general of his brigade at the great Army of the Potomac meeting here. He described his wonderful, superhuman bravery. He selected Allie as the only one to especially eulogize. God bless the brave boys! I can almost see their meeting—the hand clasp of two who gave up life for duty, and Father joined by his noble Sons, proudly and tenderly embracing them.

God bless you, dear brother! Don't lose love for me. We are alone now. My tears are falling so that I can scarcely see. Good-bye.

With all his heart your loving brother.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

OUTLINE STORY OF THE WAR EXPERIENCES OF WILLIAM B. CUSHING AS TOLD BY HIMSELF.*

I sailed from Boston in the frigate *Minnesota* and reached Hampton Roads early in May of the year 1861. The war had just commenced; the rebels had possession of Norfolk and were forming an army in Richmond.

When our ship with Admiral Stringham on board came into the Roads we found at anchor the *Cumberland, Quaker City* and *Monticello,* men-of-war. On our right hand was Fort Monroe, over which the old flag still waved, while five miles away the sun shone upon a new banner raised in defiance—an emblem of treason. The *Monticello* (which I afterwards commanded) had been in action with the battery on Sewell's Point, receiving several shots and losing a few men, gaining the honor of being the first ship under fire during the rebellion.

We had been at anchor but a day when a fleet of five sail (schooners) loaded with tobacco came boldly down from Richmond. The South, in actual rebellion, thought that none would dare molest them, and that a few of the chivalry unarmed might under cover of the name *Virginian* pass through our fleet of "cringing Yankees" and proceed upon their way, to exchange the fragrant weed for powder and shot that were required for our slaughter.

It is needless to say that we captured them all, and that night I was sailing away for Philadelphia in the prize *Delaware Farmer.* After a narrow escape, in our crazy craft, during a gale of wind, I came to anchor in port, turned over the first prize of the war to the authorities and at once returned to Fortress Monroe, only to be sent off again prize master of bark *Pioneer* bound to New York.

*Paymaster Charles Conard, U. S. Navy, deposited this story in the Navy Department Library in 1909.

Taking passage in June in the frigate *Colorado,* I proceeded to Charleston, S. C., and went on board the *Wabash,* remaining nearly a month, blockading in view of Fort Sumter. Some captures were made, after which I went up to Hampton Roads to rejoin the *Minnesota.* An expedition was fitted out in August to go up the Back River in Chesapeake Bay, to storm a battery and burn some vessels. I was sent in the first launch. We had but a slight skirmish, but burned a number of schooners. The next month the capture of the Hatteras forts was projected.

On the twenty-first of August we left Hampton Roads in the frigate *Minnesota,* flag-ship, followed by a squadron consisting of the *Wabash, Cumberland, Susquehanna, Pawnee, Monticello* and *Harriet Lane,* men-of-war, and three steam transports, bound for Hatteras Inlet, to attack the rebel forts. At this time the inlet sent forth swarms of small privateers, and furnished a convenient harbor for blockade runners, and, as the gate-way to the large inland waters of the sounds, was of great importance. Its capture being determined upon, Admiral Stringham was selected as the commander of the expedition, and entrusted with the largest fleet that had, then, ever sailed in company under the American flag. We came in sight of the forts in the evening of the twenty-seventh and on the morning of the twenty-eighth, by the aid of surf boats, succeeded in landing the few hundreds of soldiers who, under command of General Butler, accompanied us. These took position two miles north of the enemy, and were joined by the marines of the squadron, led by old Major Shuttleworth, who, full of pluck, aspired to carry his wig into an assault that might remind him of former experience in Mexico.

The batteries were earthworks, two in number, and respectively named Fort Hatteras and Fort Clark and were commanded by Commodore Barron, rebel flag-officer. At 10 o'clock the squadron had moved into position in line and the first gun was fired by the *Wabash;* answered by the rebel guns so promptly that their shot seemed but our own rebounding. This was a great moment for me, a youngster who had never been fairly under fire—and I shall never forget or again experience the wild pleasure and excitement that I felt, as the stern challenge and response passed over the blue water on that sunny August day. I commanded the quarter deck division of eight VIII-inch guns, and from my position upon deck had a fair view of every moment during the

day. If I was excited and eager, I was not so, alone, as I remember well our gallant old captain's look as the first whiz of rebel iron came to our ears. With flushed face and sparkling eye he straightened his tall form, and with gray hair bared to the sun, stamped his foot upon the bridge and impulsively exclaimed "Glorious! glorious—closer! closer!"

We were soon in action—every ship a sheet of flame from bows to stern—and at 12.30 the flags from both forts were shot away and the enemy, in the act of abandoning Fort Clark, were rushing madly along the beach, while our shell tore through and through them—and bursting sent mangled bodies high in air, or buried them by dozens in sand graves upon the shore. At 2 p. m. the American colors were hoisted upon Fort Clark, and no flag being displayed from the remaining fortification, our Admiral concluded that it had surrendered, and ordered the *Monticello* to feel her way in and gain its rear. Captain Gillis soon got aground in his attempt and the rebel guns suddenly opening fire, his vessel was in a critical situation. At least fourteen heavy guns were playing upon her at close range, but the *Monticello* promptly returned the fire, and at the same time coolly maneuvered to get out, which she succeeded in doing—in a somewhat shattered condition—covered in her retreat by the concentrated fire of the squadron. At sundown the fleet hauled off shore for the night, and we feared that the morrow might prove stormy, in which case the enemy might not only save their fort, but find our troops at their mercy. In consequence a spirit of gloom and doubt pervaded the squadron that was not lifted until the bright sun and smooth sea of the twenty-ninth proved it good fighting weather, and the signal was hoisted "All hands prepare for action."

At 8 a. m. we were again engaged, the enemy returning our fire in a spirited manner, but not again hoisting their flag after it was shot away early in the fight. The concentrated fire upon the fort was terrific—being mostly from one hundred-, and fifty-pounder guns, fired with great care. Sixty shells exploded inside the parapets in a single minute, and at 11 o'clock an eleven-inch shell penetrated the bomb-proof and entered the magazine, causing the immediate surrender.

A white flag was hoisted and a swarm of rebels appeared upon the fort, while at the same time signal was made to cease firing. Commodore Barron soon came over our side, and surrendered

his sword upon the quarter-deck and we took possession of captured men and property, bringing the prisoners, some seven hundred and fifty in number, on board the *Minnesota*.

An incident must be mentioned that professional men will appreciate. When it was ascertained that an eleven-inch shell had entered the ventilator of the enemy's magazine and thus forced a surrender, every officer in the fleet who commanded a gun of that caliber claimed the honor of the shot, and the dispute was both long and loud until it became known that the fuze cap had not been removed from the projectile, after which no claimant could be found, for no one would admit such a careless act as that of depriving the fuze of its effect.

The prisoners presented a curious and interesting appearance. They were not, in that early stage of the war, content with the ordinary weapons of a soldier, but were loaded down with bowie knives and revolvers, each man a walking armory, evidently endeavoring to justify in dress the awe-inspiring titles they assumed, such as the "Lenoir Braves," the "Tar River Boys," "Hamilton Guards," and "Jonesboro Tigers." These are a few of the ferocious company organizations that I remember, which received the hospitality of the northern prisons as soon as we could take them to New York.

Our victory at Hatteras gave General Butler his first public opportunity of showing that *modesty* for which he afterwards became so conspicuous by making speeches in which he implied that to him the credit of our action was due—whereas the affair was a purely naval one—and General Butler's only part was in placing his name with our admiral's upon the articles of capitulation, and accepting numerous serenades and dinners in the North for a merit which common decency should have forced him to disclaim.

In October, 1861, I was ordered to the *Cambridge*, a purchased screw vessel of about one thousand tons, where I did midshipman's duty until the next March. During this time we blockaded in the Rappahannock River; off Cape Henry; up the James and at Beaufort, N. C. In the first named place I saw some sharp fighting in a cutting out expedition under the command of the gallant Lieutenant Wm. Gwin, afterwards killed in action on the Mississippi River. We cut out a schooner up a narrow stream and were attacked by and defeated a large force of infantry and

artillery sent to take us. In a month we captured over four hundred negroes, or contrabands as they began to call them.

Off the Capes of Virginia my duty as boarding officer was very severe, as it was midwinter, and I was frequently out in open boats for five and six hours at a time with the icy seas and sleet dashing over me continually. Several times I was too stiff upon return to step over the ship's side and had to be hoisted on deck. This caused a sickness that sent me home and nearly cost me my life; but not before the famous *Merrimack* fight in which I had the honor to be under fire, and to lose a few drops of blood.

Our part in the action was to take in tow the sailing frigate *St. Lawrence* and steam with her to where the *Congress* and *Cumberland* were maintaining an unequal contest with the iron-clad and some consort steamers. Before we got under fire the *Cumberland* had gone down, hiding her crushed sides and bloody decks beneath the waters of the James, and a white flag at the masthead of the *Congress* told us that her fate was sealed, and that her brave commander Joe Smith was no more.

The *Minnesota,* which had preceded us, was aground desperately fighting her iron antagonist, whose shots tore through and through the wooden frigate at every moment. The *St. Lawrence* grounded under the fire of the Sewell's Point batteries, and we were soon warmly engaged with the heavy rifled guns of the enemy. With the *Merrimack* we exchanged a few shots just as she was withdrawing for the night. At 8 in the evening we got the frigate afloat, and anchored at Fortress Monroe, preparing for a desperate and hopeless fight on the morrow. It seemed as if nothing could save our wooden fleet from entire destruction, as we were then virtually disabled, but the Providential arrival of the *Monitor* changed the aspect of affairs and we awaited the morrow with an eagerness amounting to impatience. A day, big with the fate of future navies! The sun arose on a calm Sunday morning and glistened on the side of the rebel monster, pressing boldly out in the early day to finish the awful havoc that she had inaugurated.

The *Merrimack* steamed towards the *Minnesota* (still aground) preceded by the steamer *Yorktown,* scarcely noticing a black speck that moved out from behind our frigate, a something far from prepossessing in appearance and calculated to excite laughter, were it not that it bore the grand old flag, that would never

have been risked to be disgraced. "A Yankee hoax," said the enemy; and came on. Suddenly a puff of smoke rolled lazily from the *Monitor's* turret, and the leading vessel of the enemy turned and ran like a beaten cur with a two-hundred pounder Yankee shell in her ribs that had in some way been ejected from the "cheese box" with an aim and force that told of serious work ahead.

The two iron-clads now went to work in earnest fighting at close quarters and exchanging iron blows that cracked sharp and distinct against adamantine sides and sent the echo miles off amongst us spectators, riveting us with intense interest to the scene. It was settled at last. The dear old flag was safe and the national honor preserved, and even the sad fate of the *Cumberland* and *Congress* did not stifle our rejoicing. The slaughter of Saturday was avenged by the victory of Sunday! Not a man had been killed upon the *Monitor;* but her brave Captain Worden was seriously wounded.

The day after this exciting duel we sailed to blockade the rebel steamer *Nashville,* then in the harbor of Beaufort, N. C. She escaped from us, however, in the night, our captain refusing to permit me to enter the harbor and cut her out. He should have worn petticoats instead of the blue and gold of a dashing service, as his subsequent conduct proved, when, neglecting to face the enemy, he received from a court-martial a sentence more merciful than just.

I was by this time quite ill, and was sent home by a board of medical survey, but only remained ashore six weeks before being ordered to the frigate *Minnesota* again. After our capture of Norfolk, I went up the James River upon the staff of Admiral Goldsborough. It was just after the battle of Malvern Hill and McClellan was anticipating a general engagement at Harrison's Landing. My brother was on the staff of old General Sumner, and when we met I was so fired by his story of the "seven days' battle" that I could not resist the temptation, in defiance of discipline, of going on the same service in order to participate in the next affair. While ashore I rode on the staff of President Lincoln to review the army. Returning, disappointed in my warlike anticipations, to Norfolk, I was placed under suspension for leaving my Admiral. But, as a midshipman is hardly considered a responsible being, was soon released.

On July 16, 1862, I was promoted to the grade of lieutenant, jumping the two commissioned grades of master and ensign, and ordered to report for duty on the sounds of North Carolina. Here I became the executive officer of the U. S. S. *Commodore Perry*, commanded by Lieutenant-Commander Flusser, for whose memory I have the greatest admiration. He was a man of clearest judgment, lion-like bravery, and a pure patriotism. We became friends during a heavy fight up the Blackwater River, where he gave me the credit of saving the ship from boarders. The fight originated in a plan of General Dix, who was to move on Franklin with twelve thousand men, while we took three vessels up the Blackwater to cut off the retreat of the seven thousand rebels to be attacked.

The army did not move; we were prompt and at the time appointed found ourselves with two hundred men and fourteen cannon fighting against all the enemy's force. The stream was very narrow and crooked, and at the bends we had to send lines ashore, making them fast to the trees to heave the ship's bows around.

Suddenly turning a point we came bows on to a barricade, formed by felling trees from both banks right across the stream. At the same time we drifted into the left bank. At once every tree and bush and log sent forth a storm of lead, and a yell burst out that seemed to come from all directions.

We were in an ambush. As it seemed madness to fight our few men on an open deck Captain Flusser ordered all hands under cover. In a moment I looked over the side and saw a mass of infantry rushing to board us under cover of their comrades' fire.

Calling for volunteers I dashed out, cut loose the howitzer, (on field carriage), and assisted by six men and an officer, Mr. Lynch, wheeled it to the other side of the deck. By that time I was again alone; all the volunteers being dead or wounded at my feet. Without waiting an instant I sighted the piece and sent the canister crashing amongst the dense mass, now about thirty yards away.

Its effect was fearful and those who were not cut down became panic stricken and fell, all excepting the leader, a splendid looking fellow with long curly hair, who came on, waving his sword, seemingly unconscious that he was alone. He met his death ten feet from our side. The men were now sent to quarters, and a

general fight commenced, the sailors working the great guns, throwing grape and canister, and our marines, shielded by the hammocks, picking the sharpshooters out of the tree tops, from whence they fell with a crash and shriek every moment. Our only hope was now to fight our way out, as no army force appeared to aid us, and six hours followed after the downward movement commenced, filled with attacks and repulses.

We fighting to get possession of every bend, to send ashore our lines, the enemy striving in every way to keep us in the trap. Trees were cut down below us, forming barricades, and rifle pits were thrown up on every bluff and wooded point. But it was of no avail, Yankee mettle was not to succumb on that day. We butted through all obstructions, and made the rebs pay dearly for their sport. In going up stream our ship led the way; in returning the order was reversed, the *Whitehead* being lowest down, followed by the *Hunchback*, while the *Commodore Perry* brought up the rear, bloody and plucky. The leading vessels, rounding a bend, caught the fire of about a thousand infantry, concealed in a rifle pit, and after suffering severely ran by. We were some distance behind, and when we came around were entirely unexpected by the "butternuts" and were right on their flank and only two hundred yards distant. Instantly we threw a fire of shrapnel and grape shot through their trench till we could actually hear the bones crack and see the limbs fly from the mangled bodies. In five minutes the place was in our possession, and that of the dead.

At last, tired and feeble, we fired our last shot, and were clear once more, but with decks covered with the dead and wounded and slippery with blood, and the whole ship like a sieve, so full of bullet holes was she, but we had done our whole duty and could only regret that the army failed us, and that our "blue jackets" had fallen in vain.

We afterwards heard that General Dix had changed his plan and sent a steamer to notify us, but it had reached the sounds a day too late.

Brave Flusser in his short and imperfect report has complimented me upon my conduct; and those who comprehend his character know what a compliment from him means. I am as proud of it as of any in the war.

I was ordered to my first command, the gunboat *Ellis*, a captured rebel vessel. She was of iron, three-eighths of an inch in

thickness, measured about one hundred tons, and mounted an eighty-pounder * rifle gun forward, and a twelve-pounder rifle howitzer aft. As she drew but little water and could penetrate into every nook and corner I was, of course, delighted, and made up my mind to gain distinction or an honorable grave before many months should go by.

The time soon came. Bogue Inlet is an opening into the ocean about thirty miles south of Beaufort. The bar is shallow, the breakers usually high, a tall bluff guards the entrance, and the little town of Swansboro nestles in the rear, about three miles from the mouth. It having been reported to the Government that blockade running was carried on here by means of small schooners to Nassau, I was ordered down the coast to look into the matter. After a slight skirmish, I captured the town; procured provisions for my men and anchored to await events, but soon learning that the rumor of traffic was false, I started down to the southward without orders, intending to have a look into some other inlets.

I dashed into New Topsail Inlet twelve miles from Wilmington. We captured the schooner *Adelaide* with one hundred thousand dollars' worth of cotton and spirits of turpentine on board. She was just about to sail for Bermuda. I was forced to burn her. I soon returned to Beaufort and reported that I had acted without orders, but was complimented highly, and ordered to continue on the coast where I used to coal at Beaufort, and start out upon expeditions in all directions.

Within a week of the destruction of the *Adelaide* I had again attacked the same inlet and after a sharp fight with some artillery succeeded in destroying some large salt works which were of great value, salt being very scarce in the South. In looking at the coast chart my eye fell upon New River, which empties into the Atlantic about forty miles below Beaufort, N. C. I observed that it was wide and deep after the bar was crossed, and that the county seat called Onslow Court House adorned its banks about twenty miles from its mouth. In fact it seemed to me just the place for a nest of Nassau vessels and I determined to make a dash for it.

* The solid shot for the 100-pounder Parrott weighed 100 pounds, the shell 80 pounds. A solid shot fired from the *Ellis* at the Confederate battery in New River Inlet, November 24, was recently found, where it struck, by Mr. Russell J. Coles, of Danville, Va., and is now in his possession.—C. W. S.

EXTRACT FROM CUSHING'S OFFICIAL REPORT.

I entered New River Inlet on the twenty-third of November with the United States steamer *Ellis*, succeeded in passing the narrow and shallow place called the Rocks and started up the river. My object was to sweep the river, capture any vessels there, capture the town of Jacksonville, or Onslow Court House, take the Wilmington mail, and destroy any salt works that I might find on the banks. I expected to surprise the enemy in going up and then to fight my way out. Five miles from the mouth I came in sight of a vessel bound outward with a load of cotton and turpentine. The enemy fired her to prevent her falling into our hands. I ran alongside, made sure that they could not extinguish the flames, and again steamed up the river. At 1 p. m. I reached the town of Jacksonville, landed, threw out my pickets and placed guards over the public buildings. This place is the county seat of Onslow County, and quite an important town. It is situated on the right bank of the river, going up, and is thirty-five or forty miles from the mouth. I captured twenty-five stand of public arms in the court house and postoffice, quite a large mail and two schooners. I also confiscated the negroes of the Confederate post master. I forgot to mention that the town is situated upon the main turnpike road from Wilmington. Several rebel officers escaped as I neared the town and carried the news to that city.

At 2.30 p. m. I started down the river and at 5 p. m. came in sight of a camp on the bank, which I thoroughly shelled. At the point where the schooner, captured in the morning, was still burning the enemy opened fire on the *Ellis* with rifles, but were soon silenced by our guns.

I had two pilots on board, both of whom informed me that it would be impossible to take the steamer from the river that night.

High water and daylight were two things absolutely essential in order to take her out. I, therefore, came to anchor about five miles from the outer bar, took my prizes alongside, and made every preparation to repel an attack. All night long the signal fires of the enemy could be seen upon the banks. At daylight I got underway and had nearly reached the worst place in the channel when the enemy opened on us two pieces of artillery. I placed the vessel in position, at once hoisted the battle flag at the fore, the crew gave it three cheers, and we went into action. In one hour we had driven the enemy from his guns and from the

bluff and passed within a hundred yards of their position without receiving fire. Up to this time I had been in every way successful, but was here destined to meet with an accident that changed the fortunes of the day and resulted in the destruction of my vessel. About five hundred yards from the bluffs the pilots, mistaking the channel, ran the *Ellis* hard and fast aground.

All hands went to work at once to lighten her and anchors and steam were used to get her afloat, but without success. The headway of the steamer had forced her over a shoal and into a position where, as the center of a circle, we had a circumference of shoal all around. When the tide fell I sent a party ashore to take possession of the artillery abandoned in the morning, but when they reached the field it was discovered that it had been removed while we were at work upon the vessel.

If I had secured this I proposed to construct a shore battery to assist in the defense of my vessel by keeping the rebels from placing their battery in position. At dark I took one of my prize schooners alongside and proceeded to take everything out of the *Ellis* excepting the pivot gun, some ammunition, two tons of coal and a few small arms. Steam and anchor again failed to get my vessel afloat. I felt confident that the Confederates would come on me in overwhelming force, and it now became my duty to save my men. So all hands were called to muster, and the crew told that they could go aboard the schooner. I called for six volunteers to remain with me on board and fight the remaining gun. Knowing that it was almost certain death the men came forward, and two master's mates, Valentine and Barton, were amongst the number. These gentlemen subsequently behaved with coolness and bravery.

I ordered the schooner to drop down the channel out of range from the bluffs and there to wait for the termination of the impending engagement, and if we were destroyed to proceed to sea. Early in the morning the enemy opened upon us from four points with heavy rifled guns (one a Whitworth). It was a cross fire and very destructive. I replied as best I could, but in a short time the engine was disabled, and she was much cut up in every part and the only alternatives left were, surrender or a pull of one and a half miles, under their fire, in my small boat. The first of these was not, of course, to be thought of, the second I resolved to attempt. I fired the *Ellis* in five places and having seen that the battle flag was still flying, trained the gun upon the enemy so

that the vessel might fight herself after we had left, and started down the river, reached the schooner and made sail for sea. It was low water on the bar, and a heavy surf was rolling in, but the wind forced us through after striking several times. We were just in time, for about six hundred yards down the beach were several companies of cavalry trying to reach the mouth of the inlet in time to cut us off. We hoisted our flag, gave three cheers and were off. In four hours I reached Beaufort. I brought away all my men, my rifled howitzer and ammunition, the ship's stores and clothing, the men's bags and hammocks, and a portion of the small arms. I retained on board the *Ellis* a few muskets, pikes and pistols to repel boarders. I neglected to state that when I took possession of the enemy's ground on the twenty-fourth a salt work was destroyed and ten boats rendered useless that were to have been used for boarding.

At 9 a. m. the United States steamer *Ellis* was blown in pieces by the explosion of the magazine.

After my return to Newbern from this expedition I received from Major-General Foster, commanding the Department of North Carolina, a letter complimenting me on my action and with it a copy of a letter to Admiral Lee in which the general requested that I might be detailed to command a squadron of five army steam gunboats to co-operate with his forces. As I was but nineteen years of age at the time, I thought and still think this a high endorsement of my conduct in command, but I did not second the application, for the reason that I did not wish to relinquish actual naval service and desired one vessel of the navy more than a fleet of army boats. I will only add that as my magazine in the *Ellis* was entirely exposed those who volunteered to remain with me and fight for the honor of the flag, deserve great credit.

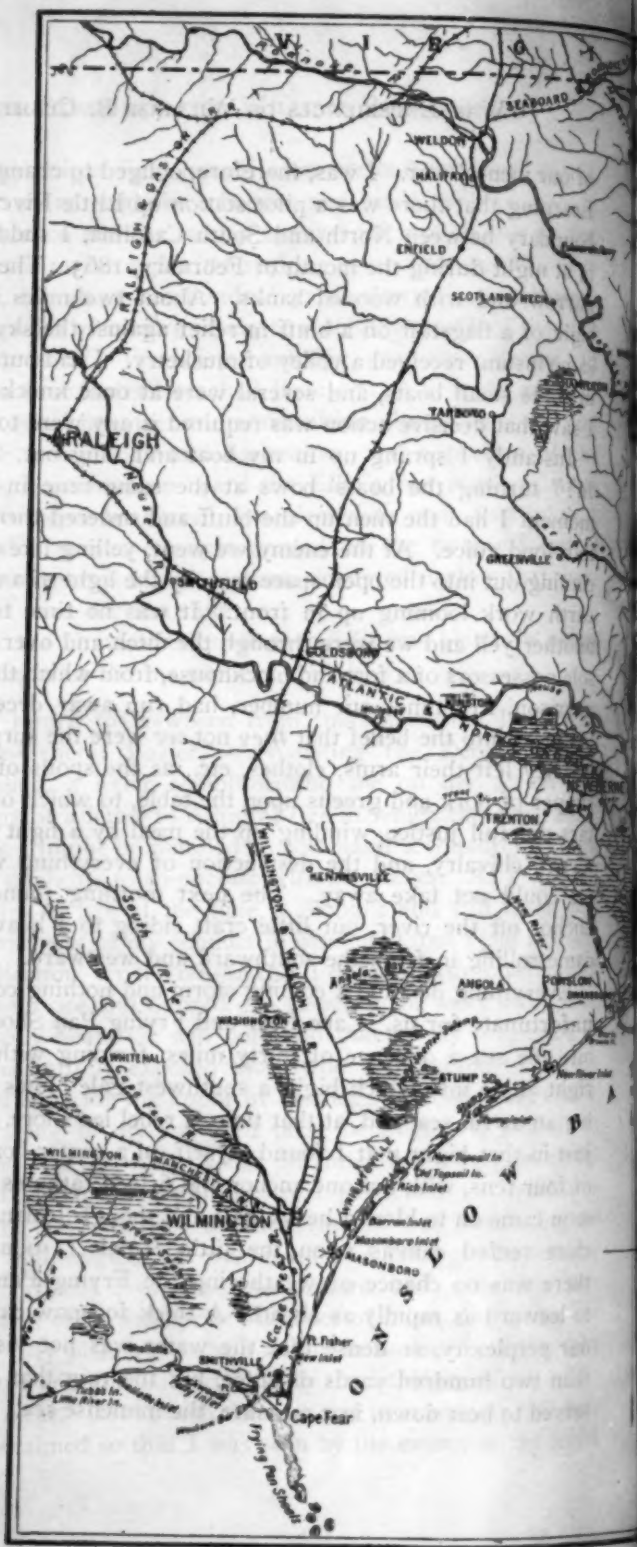
After escaping in my captured prize to Beaufort, I went to Newbern and was for some weeks off duty; but was soon to indulge in an adventure which for real peril and excitement is equal to any. At this time the Government was meditating an attack upon Wilmington, but was in want of some good pilots for that harbor. These I proposed to capture, and, receiving permission, I fitted out a little prize schooner of mine, disguising her as English. My plan was to run boldly in under the forts, take pilot on board and run out, trusting to the boldness of the affair to carry me clear. But at both the east and west bars of that harbor I was becalmed so that I was seen by the enemy in the midst

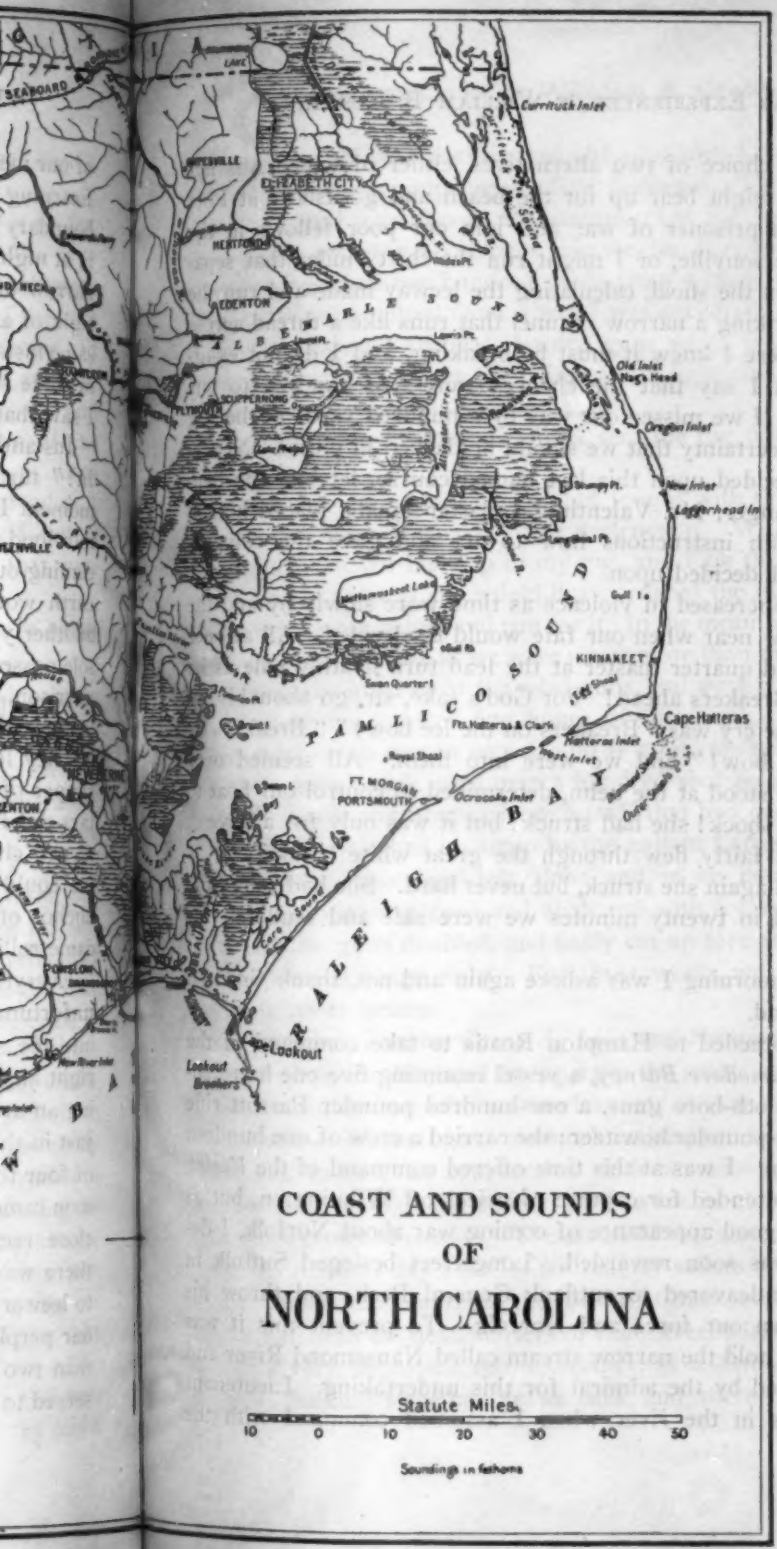
of our men-o'-war. I was, therefore, obliged to change my views. Learning that there was a pilot station up Little River just at the boundary between North and South Carolina, I suddenly dashed in at night during the month of February, 1863. The stream was narrow and with wooded banks. About two miles up I caught sight of a flagstaff on a bluff in relief against the sky, and at the same instant received a volley of musketry. I had but twenty men in three small boats, and several were at once knocked over, but I saw that decisive action was required if any were to be saved.

Instantly I sprang up in my boat and sang out, "Follow me in!" turning the boats' bows at the same time inshore. In a moment I had the men up the bluff and ordered them to charge, in a loud voice. At the enemy we went, yelling like demons, and coming out into the open space saw, by the light of a camp fire, an earth work looming up in front. It was no time to turn back, another yell and we were through the ditch and over the parapet, sole possessors of a fort and blockhouse, from which the frightened garrison, five times our number, had run away deceived by our boldness into the belief that *they* not *we* were the surprised party.

They left their arms, clothes, etc., as the spoils of war, and a supper of pork and greens upon the table, to which our tired jack tars did full justice, winding up the meal by a fight with the returned chivalry, and the destruction of everything valuable that we could not take away. The next morning found us still at anchor off the river, our little craft riding to a heavy swell that came rolling in from the southward and westward.

Everything denoted a coming storm and nothing could be more unfortunate for us. Cape Fear and Frying Pan Shoals make out into the sea a distance of thirty miles, forming with the coast a right angle into which bight a southwest gale blows direct, making an awful sea, and, at that time, a rebel lee shore. And it was just in that bight that I found myself, in a center-board schooner of four tons, with but one anchor and fifteen fathoms of chain. It soon came on to blow a heavy gale and though I managed to keep close reefed canvas upon the little *Home* I soon found that there was no chance of weathering the Frying Pan. She went to leeward as rapidly as ahead. A thick fog now came to add to our perplexity, so dense that the water was not visible at more than two hundred yards distance, but the rain that came with it served to beat down, in a measure, the immense sea.


WELDON
HALIFAX
ENFIELD
SCOTLAND NECK
TARBORO
RALEIGH
GREENVILLE
GOLDSBORO
TRENTON
KENANSVILLE
ANGOLA
WASHINGTON
WHITEHALL
ATLANTIC
WILMINGTON
MASONBORO
SMITHVILLE
Cape Fear
Frying Pan Shoals



COAST AND SOUNDS OF NORTH CAROLINA

I had my choice of two alternatives, either of which was not pleasant. I might bear up for the beach and go ashore at Fort Caswell as a prisoner of war and join our poor fellows in the hell at Andersonville, or I might run the thirty miles that separated us from the shoal, calculating the leeway made and run the chance of striking a narrow channel that runs like a thread across it. Even there I knew it must be breaking, and I do not exaggerate when I say that the chances were five hundred to one against us. If we missed our way by a hundred yards in the fog there was a certainty that we should be dashed in pieces. Nevertheless, I decided upon this last named course, let but one man know the danger, Mr. Valentine, a master's mate, placed him at the helm with instructions how to act and gave the compass course that I decided upon.

The gale increased in violence as time wore slowly by and the moment drew near when our fate would be decided. All at once I saw the old quarter master at the lead turn deathly pale as he sang out "Breakers ahead! For God's sake, sir, go about!" In an instant the cry was "Breakers on the lee bow!" "Breakers on the weather bow!" and we were into them. All seemed over now, but we stood at the helm, determined to control our boat to the last. A shock! she had struck! but it was only for a second, and she still fairly flew through the great white breakers.

Again and again she struck, but never hard. She had found the channel, and in twenty minutes we were safe and scudding for Beaufort.

The next morning I was ashore again and not, thank God! on traitor ground.

I now proceeded to Hampton Roads to take command of the steamer *Commodore Barney*, a vessel mounting five one hundred-pounder smooth-bore guns, a one-hundred pounder Parrott rifle and a twelve-pounder howitzer: she carried a crew of one hundred and fifty men. I was at this time offered command of the *Violet*, a fast boat intended for capture of prizes off Wilmington, but as there was a good appearance of coming war about Norfolk, I declined. I was soon rewarded. Longstreet besieged Suffolk in April and endeavored to outflank General Peck, and throw his army between our force and Norfolk. To prevent this it was necessary to hold the narrow stream called Nansemond River and I was selected by the admiral for this undertaking. Lieutenant Lamson was in the river when I assumed command with the

light steamers *Mount Washington* and *Stepping Stones*. I took with me besides my ship the tug boat *Cohasset*. The army gunboat *West End* was also in the stream. On the fourteenth, as Lamson was bringing his ships to join me, the *Mount Washington* grounded less than one hundred yards from a bluff, Hill's Point, and about three hundred from where I was anchored. The enemy at once unmasked a battery of rifled guns which were stationed in a sunken earth work on the point; and a fight commenced that was both stubborn and bloody.

The army soon deserted me and I sent the tug down to watch the fords below.

Lamson was soon badly cut up, but fought with the pluck of a hero against what seemed a *fated* destruction. With the rising tide I pulled aboard his ship in my gig, and took the bearings of affairs, and as soon as she would float, ordered the little *Stepping Stones* to take her in tow and run for it. In the meantime the battle was exceedingly warm, as we were never more than three hundred yards from the muzzles of the rebel guns, and were also under the fire of musketry. After five hours of this work the *Stepping Stones* went down stream with *Mount Washington* in tow, the last named vessel a wreck, with over a hundred shot holes in her, but flying the Stars and Stripes from a staff that had been thrice cut away and thrice lashed up again by the gallant Lamson.

The *Barney* was now left alone and in an hour more had silenced the opposing guns and anchored with a loss of many of her crew, two guns disabled, and badly cut up fore and aft. This was certainly a tough fight. For three weeks we fought daily and were never beaten.

The steamers *Yankee, Coeur de Lion* and *Primrose* meanwhile reported to me for duty and took part in the sport. In the contest I met as enemies one who was a classmate at Annapolis and one cousin, both of whom it gave me much satisfaction to defeat. One night our sailors, in conjunction with an army detachment, stormed and captured the sunken earth-work in our front, bringing off six captured cannon. The credit of this was mainly due to Lamson. Another day I landed with ninety sailors and a howitzer, marched inland and captured the town of Chuckatuck, four hours after it had been the headquarters of Longstreet's left wing. This proved a very important reconnoissance, as it demonstrated that the rebel flanking force had drawn back, and, therefore, that their

main body was moving away to reinforce Lee for the expected battle with Hooker's force.

A circumstance of my raid, which at the time furnished much amusement to our army, is worth relating. After driving in the cavalry pickets of the enemy, I ambushed half of the men at some cross roads to protect my rear and then advanced towards the town. Having captured a cart drawn by two mules, I converted it into a limber, placing my ammunition inside and making fast the trail rope of the howitzer to the rear. We could then advance at the double quick. As we entered the streets of the town a rebel cavalry company came charging around a corner two hundred yards away with drawn sabers and horses at a gallop. I instantly unlimbered and blazed away, but the shrapnel just went over them and burst in their rear. At the sound of the gun the mules dashed off at a run, right against the advancing cavalry, with the old cart swinging first to one side and then to the other of the road. Mules and cavalry came in contact in the narrow street and great confusion ensued.

"Load with canister," said I. "All gone in the mule cart, sir!" was the answer. Sure enough! It was all gone and I had not an ounce of ammunition. Something had to be done, so I ordered a charge and the novel sight ensued of sailors charging and beating cavalry. We killed a number, recaptured our cart, took the town and several of the enemies' horses all equipped with pistols at the saddle bows. After mounting the officers a fine horse remained that I desired to save so I shipped an old tar on his back and we started to return.

In going through some woods we were attacked when I again made use of my howitzer, which had the same effect on the old sailor's animal that it had previously on the mules, he went about and shaped a course right back for town.

Jack saw that he was struck by a squall and tried to luff, but it was of no use and as for anchoring it was just out of the question. But discipline in the school of danger now came to his assistance. Quickly pulling out one of the pistols from the holsters he placed the muzzle at the horse's ear and blazed away. The speed of the runaway was great so that it took about a dozen bounds, end over end, to satisfy his momentum, and our jolly "shell back" found himself seated in a ditch with the wreck alongside.

Stripping the rigging off he came in to join us, with the saddle on his back, swearing against a craft that wouldn't answer its helm.

While engaged one morning with two batteries, my bow guns, with one a quarter of a mile away and the broadside against another on Le Compte's Hill twelve hundred yards distant, I had a narrow escape.

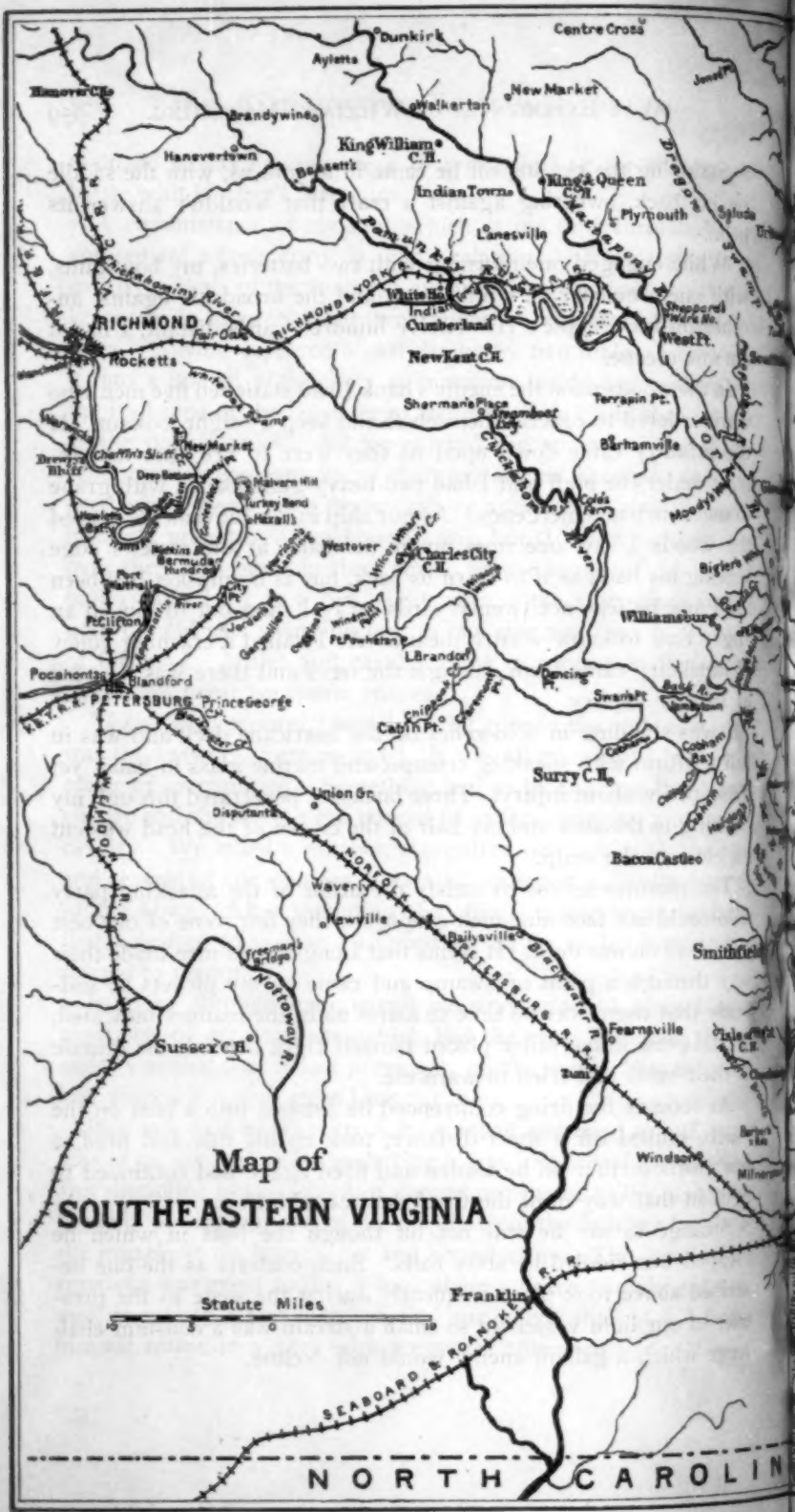
In the woods upon the enemy's bank I had stationed five men who were ordered to conceal themselves and keep a bright lookout. If the infantry came down upon us they were to fire once and retreat under the bluff and I had two heavy guns loaded with grape to meet such an emergency. As our ship in her movements neared the woods I saw one man under the bank at the water's edge waving his hand as if to warn us back, but as no musket had been fired and he was not twenty yards away I sang out to him in an angry tone to know what it meant. As I hailed a crashing volley of musketry came from amongst the trees and there was no need of further inquiry.

I was standing in bold relief on the hurricane deck and was in full uniform with speaking trumpet and marine glass in hand, yet I escaped without injury. Three buckshot penetrated through my clothing to the skin and my hair at the crown of the head was cut off close to the scalp.

Ten minutes served to satisfy the ardor of the attacking party who could not face nine-inch grape, but they left some of our best men dead on our deck. It seems that Longstreet's men made their way through a point of swamp and came on my pickets so suddenly that there was no time to alarm us in the manner indicated, but this one brave sailor placed himself right beneath the muzzle of their rifles and tried to warn me.

As soon as the firing commenced he jumped into a boat on the beach, sculled off a short distance, took up his rifle and fired, a few yards further on he loaded and fired again, and continued to fight in that way until the Confederates withdrew.

Strange to say he was not hit though the boat in which he escaped was riddled by sixty balls. Such contests as the one described above took place frequently during the siege as the presence of our light vessels in so small a stream was a constant challenge which a gallant enemy would not decline.



Map of

SOUTHEASTERN VIRGINIA

CHESAPEAKE BAY
Broad Water
Newtown
Drummondtown
Pungoteague Town
Cedar
Paramores I.
Haddocktown
Little Machipongo Inlet
Hog I.
Great Machipongo Inlet
Nassawadox Cr.
Mattawoman Cr.
Eastville
Cherrystone Inl.
Mockhorn I.
Sand Shoal In.
New Inlet
Ship Shoal In.
Little In.
Smith's I.
Guy's Pt.
Capeville
Fisherman's I.
Cape Charles
Cape Henry
Lynn Haven Bay
Willoughbys Pt.
Sewells Pt.
HAMPTON ROADS
Fortress Monroe
Old Pt. Comfort
Hampton
L. Bethel
Back R. Pt.
Back R.
Norfolk Co.
NORFOLK
Portsmouth
Great Bridge
Princess Anne C.H.
A. & C. Canal
Back Bay
False Cape
West River
Drummond Lake
Mill Swamp
Rappahannock R.
Stingray Pt.
Mantatank R.
Cherry Pt.
Milford Haven
Mathews C.H.
Garden Cr.
Wolf Trap Pt.
Pt. No Point
Horn Harbor
New Pt. Comfort
Monday Pt.
Todds Pt.
Back Cr.
North Pt.
Mosquito Pt.
Windmill Pt.
Hughlett's Pt.
Lancaster C.H.
Gwynn's I.
Walkes
Tiers Pt.

In this campaign it is my opinion that very bad generalship was shown by the commanding officer of our army in Suffolk, General Peck. When I found that Longstreet's left wing, or flanking force, had fallen back I at once concluded that his main force was moving to join Lee because it must either be so moving or massing upon a front for assault where they knew defeat to be certain.

That Longstreet knew Peck's defenses and numbers I cannot doubt, for I captured an engineer officer of his force with the plans of our works, their names and the number and position of our men, in his possession and it was mere madness with such information to think of storming our front.

They must then have been in retreat, leaving but two or three thousand men to amuse our general, and it was with this information that I rode nine miles in a dark night and drenching rain to urge an advance of our forces. I wrote to Admiral Lee at the same time the state of the case and did not hesitate to say that Peck had it in his power to either capture what men remained, or keep Longstreet's main body north of the Blackwater.

But the general was convinced that the enemy was massing on his front and did not advance for a week when, as I predicted, a mere shell was found, a skirmish line, that went off like a puff of smoke before our regiments.

Admiral S. P. Lee will remember how constantly I urged my opinion in regard to Longstreet's strategy and he at the time agreed with me in thinking Peck too timid for the public good. At the close of our duty in the Nansemond I received from the Secretary of the Navy a letter of congratulation and thanks. My vessel was so badly cut up as to need repairs at some navy yard and we were ordered to Baltimore, where in the course of six weeks she was again put in fighting trim.

In the meantime I had the honor of being privately presented to President Lincoln and enjoyed keenly an hour's conversation with him. His Excellency was pleased to compliment me heartily upon my success.

After doing duty for some time in the James River, my ship was ordered on an expedition up the York River to "White House." In this raid, near Richmond, Brigadier General Lee, a son of Robert E., was captured. In June of '63 the rebels advanced into Maryland, and, Washington being threatened, my command was ordered to the Capital to defend the city. Soon after my arrival the battle of Gettysburg took place.

In that action my brother fell fighting most nobly in command of Battery A, Fourth U. S. Artillery.

I at once proceeded to the field with the double purpose of securing his body and, as all his officers were killed, of fighting his guns, if permitted to do so, in the next battle. The field, when I reached it, was a sickening sight. Thirty thousand wounded men and thousands of unburied dead lay on the earth, in road, field, wood and orchard, and under the scorching sun on the bare hillside amidst all the wreck of a great battle. Dismounted cannon, dead horses, exploded caissons and broken muskets were everywhere and the artillery position on Cemetery Hill was almost paved with the rebel iron that had been hurled by the hundred and fifty guns massed against it previous to the final charge.

My brother's battery was destroyed. Five out of the six guns were dismounted, all the officers and most of the men were shot and seventy of its horses stiffened upon the wooded knoll where they were placed for shelter. Our army had moved on in pursuit of the foe and there was nothing left for me to do but to return to naval duty.

As I write this, rocked on the long swell of the Pacific, under the warmth of an equatorial sun, my mind goes back in review of the many sad scenes in those bloody years of rebellion but fails to bring up any picture that is so grand or solemn or mournful as that great theater of death.

The wounds were not alone for those who fell upon the field. There is suffering greater than the dying know, the prolonged anguish of those left behind to mourn them.

In the month of August, 1863, the steamer *Shokokon* was sent upon the blockade as an experiment of the Navy Department. She was a large and fast ferry boat with the hull built out, and, supposing her then to be seaworthy, possessed many advantages in maneuvering amongst the shoals off Wilmington harbor.

Hardly had she gained the squadron on the coast, ere, without a trial, she was pronounced seaworthy and ordered by the senior officer to return to Hampton Roads. This did not suit the ideas of our admiral, and, her commanding officer being relieved, I was ordered to her and sent to sea. Now *I* had serious doubts as to whether she would survive a good stiff gale, but made up my mind to find out, consoling myself with the philosophy of Bryan Bolin, "That there's ground at the bottom." Within the first

week we drove ashore the large blockade running steamer *Hebe* while endeavoring to run in and though prevented by a gale of wind from towing her off, succeeded in burning her after a sharp fight with a rebel battery of rifled guns.

Two days after I discovered a vessel in New Topsail Inlet and requested permission to cut her out, but the senior officer declined to permit it upon the curious plea of "risk of life" and responsibility.

I, therefore, determined to try it without permission. By sending in boats we discovered that a battery of six guns guarded the mouth and that the distance to the wharf at which our coveted prize was secured was about six miles. Strategy was required to insure success and avert blood shed. I anchored the *Shokokon* close into the beach, about four miles to the northward of the mouth of the inlet, which position left me separated by about half a mile from the sound inside, the intermediate land being covered with scrub oak. The enemy seeing us at anchor concluded that a boat expedition was preparing to go in at the mouth of the opening and made every preparation for our reception.

One gun, with twenty men and the captain, went up to the wharf where the piece was pointed to rake the deck of their vessel, the other guns were left, ready to blow us out of water, in their original position. Then men were posted at the mast heads of their craft and all was deemed secure.

Night came and so did the Yankees. Instead of going in at the mouth of the inlet I took ashore, four miles above it, two boats' crews, made them shoulder the dingey (a very small boat) and carry it across the neck of land, launching it in the reeds two miles from the blockade runner and in a position entirely outflanking the main battery. To shorten the story, we surprised and charged in the night with six sailors the force guarding the schooner, routed them, took their artillery and ten prisoners, including the captain, burned the vessel and destroyed some large salt works. In doing this two men were thrown out as pickets, two guarded the prisoners and two, assisted by the plantation darkies, burned the vessel and buildings. The prisoners proved an elephant in our hands for the dingy was entirely too small to bring them off and it was impossible to guard them in moving through the thick brush in the darkness. A great show of orders was, therefore, made to imaginary boats off upon the water and

ordering three of the prisoners into the dingey the rest were instructed to go a quarter of a mile up the bank and report to a Lieutenant Jones, who was supposed to be there to receive them. They were cautioned not to go too far out, or our pickets might shoot them, and went off without an idea of the smallness of our force, or our inability to take them with us.

The next morning, upon coming in sight of the squadron, I found them in by the beach engaging a battery which was situated near the wreck of the *Hebe*. Knowing the water well I got a position close in and proceeded to serve out grape and canister, but becoming impatient, hoisted signal for permission to board. Not receiving an answer I went on board the admiral's ship and asked permission to take the guns by storm. This proposition was declined as it was intended to shell them a while longer and then to land two hundred sailors and marines to cut the enemy off. But to be within grape range and not act was too much for my patience. I lowered two boats upon the side away from the enemy, took twenty men and in a moment dashed around the stern and ashore. We took two rifled pieces, one a Whitworth, and when assistance came from the flagship got them off my vessel.

I never was credited officially with this, perhaps because I disobeyed orders, or, maybe, for the reason that the great fish present could not surrender so dainty a morsel to a youngster. Shortly after this we were caught in a very heavy northeast gale and were nearly lost. All the ships had to run to sea and my only chance was to get around the shoal under the lee of Smith's Island. This I succeeded in doing but only when my sponsons were knocked away, decks raised and boiler wrenched from the hull by the storm. It was close work and quite experiment enough. So thought Admiral Lee, who believed us under water until we steamed to meet him upon his return two days after. I was detached from the *Shokokon* and ordered to Washington as bearer of despatches. That I was not forgotten in these, I judge from the fact that I was ordered to command the *Monticello*, then fitting out in Philadelphia, Mr. Fox saying: "You are ordered to this command for distinguished services rendered."

I was now ashore for some months superintending the outfit of my vessel. The times were decidedly squally, the electioneering feeling in Pennsylvania running very high. I was glad enough to get to sea again after being placed in "durance vile" for thrashing

a few of the "copperheads" who insulted me for no other reason than because I wore the uniform of my country's navy. In February, 1864, I was off Wilmington blockading. In the day time we had stations for anchoring out of range of the enemy's shot. In the night each ship crept close in along the bar, the lead colored hulls blending in with fog and foam and every eye alert to catch sight of an entering or escaping steamer. Great care was required not to run ashore and to avoid being disabled by the rebel fire when the moon came out and found us close under a hundred of their cannon.

I was forced to get all the sleep that I required during the afternoon, never at night.

They had a practice ashore of trying to disable us by pointing a number of guns with different elevations in the same plane of fire, so that when all were fired one was apt to take effect. Besides the line of ships close in, there was a squadron in position well off from the coast. It was the duty of these cruisers to calculate for moon and tide, the time that a steamer would be most likely to escape from the harbor and supposing her to make through the night a certain number of knots speed, place themselves where they would probably sight the black smoke in the morning. The lookout at the mastheads commanded a horizon of some fifteen miles and many a steamer was so seen and captured. As the sun commenced to light up the ocean the hail would come from aloft, "Black smoke, sir!" "Where away?" "Two points on the port bow, sir!" and the exciting chase would commence.

It was exciting. Sometimes a few hours sufficed in which to overhaul the lead colored fugitive, often darkness would terminate an unsuccessful chase and our blue jackets would have to console themselves by the saying that "there are as good fish in the sea as ever were caught," a poor substitute for the half million dollars that had run away from them during the day. In many of these races the "runner," when hard pressed, would throw overboard her deck load of cotton and it was not an uncommon thing to see a hundred thousand dollars' worth of the "royal staple" floating unheeded by.

On the night of the twenty-second of February the *Monticello* was inshore off Fort Caswell and I made up my mind that the birthday of Washington was entitled to a celebration. I, therefore, muffled the oars of three of our boats and with forty men succeeded in passing in between the forts into the harbor.

My object was to find a prize inside, capture her by boarding and run out by their guns to our squadron.

There were no vessels at the anchorage so I thought of dashing into a heavy battery on Smith's Island and bringing off its flag. Pulling in with my gig to reconnoiter, I found that when my oars grazed the face of the work I was not challenged. The rebels felt perfectly secure and had grown careless. As my force was small I determined to give no alarm but to get reinforcements from the squadron and with the senior officer's permission to take and *hold* the island until relieved by the army force. Such an event would have closed to the enemy one of the troublesome entrances to Cape Fear River. I could have effected this result with two hundred men, but as usual met the reply to my proposal, "Can't take the responsibility." This, I confess, provoked me and I told the senior officer I could not only do that, but if he wanted the Confederate general off to breakfast I would bring him. I then left and went to my ship.

That night I took twenty men, pulled by the forts and straight up the river to the town of Smithville, the rebel headquarters. I knew nothing of it excepting that fact and its position on the chart, but my plan was too bold to fail. I succeeded in landing right in front of the hotel not thirty yards from the angle of the fort, in the center of the town, and hid my men under the bluff. We then crept down to a salt work on the point and captured two darkies who were there at work, thus gaining what information I desired. My object was to take the commanding general from his bed, in the midst of his men, and to take him out of the harbor in one of his own steamers. But alas! no steamer was there. Leaving most of the sailors in ambush, I crept up the street with the negro guide and two of my officers, soon reaching a large house with a southern veranda—the general's residence.

It was directly opposite the barracks in which twelve hundred men were sleeping and not fifty feet from them. Gaining the door I opened it and proceeded to explore, finding first a mess room, then some stairs up which I made my way. Lighting a match at the top I saw some doors and had just opened one of them when I heard a crash below and my officers' voices saying, "Captain! captain!" Down I went and opened a door below, striking a wax match at the same time and by the flash I saw a man in dishabille with a chair in hand as if to strike. Dashing

in at once I had him on his back in an instant with the muzzle of a revolver at his temple and my hand on his throat. I doubted not but that my prize was the dignitary sought. Threatening to kill him if he spoke, I struck another match and lit the candle. I then found that it was the chief engineer of the defences that I had and that the general was away in Wilmington. Besides this misfortune the adjutant-general had just escaped from the house. It seems that his bed was close to the window and hearing a noise he arose and looked out. The first sight that met his eye was the muzzle of a navy revolver about two inches from his nose. Down went the window with a crash and the fearfully demoralized officer, wrenching his arm through, dashed out of the back door in garments hardly fitted for display. It was a good joke but not exactly the time for me to laugh at it as I knew that soldiers would swarm out like angry bees in a minute. So I hurried my prisoner into his most necessary garments, pocketed the papers of the absconding adjutant and hastened down to my boat. The town was alive by this time, but like the old gent with the spectacles on his forehead, looking everywhere but in the right place.

I shoved off with officer and contrabands and was nearly down to Fort Caswell before the signal lights told the sentinel forts that Yankee boats were in the harbor, and while the long roll was beating there, and the "butternuts" rushing to their guns, I quietly pulled through the opening and off to my ship.

It was 12 o'clock at night when I entered the headquarters and moonlight; at one I was in my cabin, had given my rebel dry socks and a glass of sherry, laughed at him and put him to bed.

The next morning, to the astonishment of the senior officer, I took my guest off to breakfast and requested permission to send in a flag of truce for his clothes and some money. My boat was permitted to land on the beach and the officer whom I sent in was met as he went ashore by Colonel Jones, the Commander of Fort Caswell. My officer's name was Jones also, and he had been with me the night before. Both of these gentlemen were on their extreme dignity, the colonel saying that he would telegraph up to Smithville and see if he could receive the flag of truce.

They walked up and down the beach in silence and passed each other several times, when the rebel wheeled sharply and suddenly

round and exclaimed: "That was a d—d splendid affair, sir." This broke the ice, and a chat ensued, soon joined in by the adjutant-general with arm in a sling and limping from the effects of his impromptu promenade of the night before. My prisoner's clothes were sent for, and bacon and hard tack with which to regale their guest. A letter was now produced which I sent in for the general. It read as follows:

MY DEAR GENERAL: I deeply regret that you were not at home when I called. I enclose my card.

Very respectfully,
W. B. CUSHING.

This was unanimously declared the essence of impudence but did not prevent them from sending me off the latest papers. They could not guess where I entered or escaped from the harbor as they said that thousands of eyes watched every square inch of it. The next day I started for Beaufort to coal and early in the morning ran into and sunk the U. S. S. *Peterhoff*, formerly the famous blockade runner. It was an unavoidable accident, arising from the strict rules of the blockade that required instantaneous signals in order to avoid being fired into or run down. My false stem was carried away and we proceeded to Norfolk for repairs.

Returning to my coaling station at Beaufort in the month of June, we heard that the rebel iron-clad *Raleigh* had been out amongst our fleet at Wilmington, escorting some blockade runners at night and remaining out until morning. Why she was not attacked I do not to this day know, but as soon as we heard the news Lieutenant-Commander Braine in the *Vicksburg* and myself in the *Monticello* started down the coast determined to ram her in company upon sight. In case she were inside I made out a written application and plan to take her by boarding in the harbor. I sent a copy of this to Admiral Lee at Hampton Roads and took the other down to submit it to the senior officer. As usual, no one would take responsibility excepting myself. I argued that the noses of the squadron had virtually been pulled and begged permission to go in, promising not to come out alive if I failed. It was of no use.

Captain Sands declined to give me the men and it was not until some time after that I received a letter from Admiral Lee "heartily approving" my course and permitting me to call upon

the senior officer for such men and boats as I desired. It was disgraceful to delay it an hour! On the night of June twenty-fifth with fifteen men and two officers,* Howorth and Martin, I ran by Forts Caswell, Holmes and the outer batteries guarding the harbor. With muffled oars we proceeded up the stream, keeping a bright lookout for the iron-clad and for the guard boats. In passing the town of Smithville I was nearly run down by a tug but passed on unsuspected. I was determined to find the *Raleigh* and having ascertained her berth go out and bring back a hundred men to take her.

Not finding the object of our search at the anchorage inside either bar or at the quarantine, I continued on up the river. The moon was shining brightly on our side as we came up abreast of Fort Anderson and suddenly the sentry's hail came across the water, "Boat ahoy!" The cry was repeated by a dozen voices and followed by the fire of musketry. It was too near daylight to make my way out, if I desired it (and I did not) so I determined upon a bit of strategy.

Instantly turning the boat I let them see her in the moonlight, apparently pulling rapidly down stream, then giving her a sheer with the helm I cut off the moon's rays from their line of sight and my boat was invisible in the swell. In this manner I gained the shadow of the opposite bank and under its cover pulled straight up toward Wilmington, leaving them to send their boats and alarm *down* the river.

Thus I passed safely by fort and obstructions, continuing on until within four miles of the city, when as it was almost daylight I prepared for concealment.

We landed and hauled the boat, by great effort, over a strip of sand into some swamp grass, concealing it within branches of trees, after which we stowed ourselves away in the bushes on the bank close to the channel and in a fine position to see all movements of vessels in the river. Eight steamers passed us during the day, amongst them the *Yadkin*, flagship of the rebel Commodore Lynch, but no iron-clad appeared. Just at dark two boats came close in around a point of marsh and looked like an attacking party, so with my men all ready behind a log, I walked

* This expedition left the *Monticello* 8.10 p. m. June 23, and Cushing's official report states that Howorth and J. E. Jones were the two officers who accompanied him.—C. W. S.

out and hailed them, ordering them to surrender. This they did, but proved to be a fishing party of white men from Wilmington. From them I learned that the *Raleigh* had run upon a bar at high water and that as the tide fell the weight of armor had caused her to split open. She was under water. My next thought was to learn all that was possible about the batteries, roads and obstructions, as I knew that our government soon intended a movement on so important and troublesome a place. Taking the fishermen as guides we moved up to the city, examining everything and discovered the nature of the channel obstructions. Pulling down again we went into a creek about four miles below the town and made our way through a cypress swamp to a road which we started off to explore. Finding the main turnpike and telegraph two miles off I hastened to station myself with eight men at the junction of it with two other roads, leaving the rest of the men in ambush near our boat. We were now just outside of the rebel city in the midst of swarms of soldiers and lines of fortifications and it was policy to keep very quiet, but we were growing hungry and a little cross and did not long suffer people to pass unmolested. The first man captured was a hunter who proved to be keeper of a store a mile away, the next was the army mail carrier with a bag of four hundred letters and documents which were eagerly overhauled, discovering the plan and strength of the defenses and number of men in rebel garrisons.

The next thing to be thought of was food. Those who fight must eat and our hard-tack and salt-horse had long since disappeared. Mr. Howorth was, therefore, dressed in the hat and jacket of the Georgia cavalryman, mounted upon his horse and started off to the store of our captured friend, with a pocket full of Confederate money taken from the mail, and the "brass" requisite for his dangerous adventure.

This gallant officer returned safely after mingling freely with soldiers and having to spin a long yarn to an inquisitive female who had a brother in the place which he named as his home. The chickens and milk that he brought back were excellent and had only been obtained by a free use of the storekeeper's name, whom he declared he had met hunting down the road and who had expressly told him to say to Lizzy that I tell her to sell 'em. These articles with the blackberries growing near us formed a meal that could not be improved in Seceshia and left us ready for

anything. Although we permitted most people to pass unmolested, there were some whom it was policy to take and in the afternoon I found my eight men guarding twenty-six prisoners, any one of whom with pluck enough to shout might bring down upon us a swarm of "chivalry." This was becoming too much like the Irishman's tartar and I concluded only to wait for the courier from the city for the evening papers and Richmond news before making for the boat. Mounting a horse I posted myself like a highwayman by the roadside and awaited his coming, but concluded in the meantime to send my prisoners under guard down to the swamp. This move was unfortunate for just as they filed across the road into the woods my expected mail carrier came over a knoll, two hundred yards away, with another mounted man in company. Seeing the blue shirts and carbines they knew at once what had become of the morning courier and instantly wheeled about. I pursued, but to no purpose, my cavalry brigade was tired and soon distanced. I now, for the first time, cut the wires to prevent them from sending a message to Fort Fisher and made for the boat with all speed, placed my prisoners in canoes, took them in tow and moved down toward the river which we entered at dusk.

I now determined to place the most of the captured men in the lighthouse on Marsh Island which had no keeper, and then escape before the pursuit should become too hot to permit it, but just as I neared it the steamer *Virginia* rounded the point and came right at us. I instantly ordered the men to jump overboard and shove the boats in close to the marsh grass, holding their heads below the gunwale and threatened any prisoner who spoke with immediate death. In the dark our ruse succeeded, the steamer passed within ten feet of us and failed to discover their Yankee visitors.

I now took away the oars and sails from the canoes and set twenty men adrift in the tideway, knowing that they would be picked up in the morning, and also made fast a note to a buoy, reminding Colonel Jones of his boast that I would never enter the harbor again. We had now to get down by Fort Anderson, Fort Fisher, the forts on Zeek's Island, and batteries, Campbell and the Mound, and it was quite certain that their boats would be ready to intercept us at the bar. Passing Anderson undiscovered we captured a boatload of soldiers and were informed that there

was a guard-boat out, containing seventy-five musketeers waiting for us. The tide was now in our favor and I concluded to pull boldly for the bar, run foul of the guard-boat, use cutlasses and revolvers and drift by the batteries in that way since they would not fire on their own men. It was within an hour of daylight and everything was as bright in the moon's rays as if dawn were, indeed, come. As we neared Confederate Point a boat was seen rising and falling with the swell and our course was at once shaped for it. My men were eager to commence so unequal a fight, feeling confidence in themselves, in an encounter with five times their number of soldiers on the water. My orders were to wait for my word and *then* all but the two bow oars "trail" and take to their arms while I sheered in and laid our boat aboard. The eight rebel soldiers with us I promised immediate death upon the least sign that they would aid their comrades.

When some fifteen yards from the object of attack I ordered those not pulling to aim and was about to pour in a broadside when four more boats shot out from Confederate Point and five from Zeek's Island, pulling so as to form a line across the whole entrance. At the first glimpse I saw the trap and formed the only plan that hope left me. With helm hard aport we went short around but only to find a large boat to windward under canvas. We were now at the junction of the two channels where the tide splits, one leading down seven miles below to Caswell, where I had entered, and the other where I proposed to go out. At the Caswell entrance a southwest gale had been blowing and it was no doubt breaking clear across the bar; besides it would be daylight ere we could have passed Smithville or the forts, so our only chance was at Fisher. Dashing off with the tide in the direction of Smithville, I passed the sail boat, and by my trick of sheering the cutter so as to avoid reflecting the moon's rays, caused the enemy's main line of boats to lose sight of her in the swell.

Being soldiers they did not take into consideration the facts regarding the impossibility of escape at the west bar and concluded that I was making for it. The whole line came after in pursuit, leaving their original station unguarded. That was my time and it was improved. Suddenly turning we approached the sail boat as if to board, when her crew lost their nerve and tried to tack. Missing stays they drifted off with the tide, while we shot around in a semi-circle and cut under the stem of the line of boats in chase.

Then they saw us but too late. We gained the channel a hundred yards the start of the leading boat and to prevent being blown out of water by the forts, plunged boldly into the breakers upon Caroline Shoal and went through safely, the army boats not daring to follow. In this expedition I did not sleep for sixty-eight hours.

For this as for my previous visit to the harbor I received the official thanks of the Navy Department.

About this time the Government was laboring under much anxiety in regard to the condition of affairs in the sounds of North Carolina. Some months previous a rebel iron-clad had made her appearance attacking Plymouth, beating our fleet, sinking the *Southfield* and killing Captain Flusser, who commanded the flotilla. General Wessel's brigade was forced to surrender and all that section of country and line of Roanoke River fell into rebel hands.

The "Little Washington" and the "Tar River" were thus outflanked and lost to us. Some time after, this iron-clad, the *Albemarle,* steamed out into the open sound and engaged nine of our steamers, doing much damage and suffering little. The *Sassacus* attempted to run her down but failed and had her boiler exploded by one of the two hundred-pounder shell fired from the Confederate. The Government had no iron-clad that could cross Hatteras bar and enter the sounds, and it seemed likely that our wooden ships would be defeated, leaving Newbern, Roanoke Island and other points endangered. At all events it was impossible for any number of our vessels to injure her at Plymouth and the expense of our squadron kept to watch her was very great. At this stage of affairs Admiral S. P. Lee was speaking to me of the case when I proposed a plan for her capture or destruction. I submitted, in writing, two plans either of which I was willing to undertake.

The first was based upon the fact that through a thick swamp the iron-clad might be approached to within a few hundred yards. India rubber boats to be inflated and carried upon men's backs might be procured and transported by a boarding party of a hundred men, or two low-pressure and very small steamers, each armed with a torpedo and howitzer, might constitute the offensive force. In this last named plan (which had my preference) I intended that one boat should dash in while the other stood by to

throw canister and renew the attempt if the first failed. It would also be useful to pick up our men if the attacking boat were disabled. Admiral Lee believed that the plan was good and ordered me to Washington to submit it to the Secretary of the Navy. Mr. Fox doubted the merit of the affair, but concluded to order me to New York to purchase suitable vessels. Finding some boats building for picket duty, I selected two and proceeded to fit them out. They were open launches about thirty feet in length with small engines and propelled by a screw. A twelve-pounder howitzer was fitted to the bows of each and a broom rigged out, some fourteen feet in length, swinging by a goose-neck hinge to the bluff of the bow. A topping lift to a stanchion inboard raised or lowered it and the torpedo was fitted into an iron slide at the end. This was intended to be detached from the boom by means of a heel jigger leading inboard and exploded by another line connecting with a pin which held a grape shot over nipple and cap.

The torpedo was, I believe, the invention of Engineer Lay of the Navy and introduced by Chief Engineer Wood. It has many defects and I would not again attempt its use. Everything being complete we started to the southward, taking the boats through the canals to Chesapeake Bay and losing one in going down to Norfolk. This was a great misfortune and I have never understood how so stupid a thing occurred. I forget the name of the volunteer ensign to whose care it was entrusted, but am pleased to know that he was taken prisoner. I trust that his bed was not of down or his food that of princes while in rebel hands.

My best boat being thus lost I proceeded with one alone to make my way through the Chesapeake and Albemarle Canal into the sounds. Half way through the canal was filled up, but finding a small creek that emptied into it below the obstruction I endeavored to feel my way through. Encountering a mill dam, we waited for high water and ran the launch over it. Below she grounded but I got a flat boat and, taking out gun and coal, succeeded in two days in getting her through.

Passing with but seven men through the canal where for thirty miles there was no guard or union inhabitant, I reached the sound and ran before a gale of wind to Roanoke Island. Here I pretended that we were going to Beaufort and engaged to take two passengers along. This deception became necessary in con-

sequence of the close proximity of the rebel forces. If any person had known our destination the news would have reached Plymouth before we arrived to confirm it.

So in the middle of the night I steamed off into the darkness and in the morning was out of sight.

Fifty miles up the sound I found the fleet anchored off the mouth of the river and awaiting the ram's appearance. Here I, for the first time, disclosed to my officers and men our object and told them that they were at liberty to go or not as they pleased. These, seven in number, all volunteered. One of them was Mr. Howorth, of the *Monticello,* who had been with me repeatedly in expeditions of peril. The names of all who went with me I give in conclusion. Six were added to my original force. Amongst these was Assistant Paymaster Frank Swan, who came to me as we were about to start and urged that he might go, as he had never been in a fight. Disregarding my remark that it was a bad time for initiation he still made the request and joined us. He found an eventful night of it, being wounded and spending his next four months in Libby Prison and Salisbury.

The Roanoke River is a stream averaging one hundred and fifty yards in width and quite deep. Eight miles from the mouth was the town of Plymouth, where the ram was moored. Several thousand soldiers occupied town and forts and held both banks of the stream.

A mile below the ram was the wreck of the *Southfield* with hurricane deck above water and on this a guard was stationed to give notice of anything suspicious or fire rockets in case of attack. Thus it seemed impossible to surprise them or to attack with hope of success. Impossibilities are for the timid: we determined to overcome all obstacles. On the night of the twenty-seventh of October we entered the river, taking in tow a small cutter with a few men, the duty of which was to dash aboard the *Southfield* at the first hail and prevent any rocket from being ignited.

Fortune was with our little boat and we actually passed within thirty feet of the pickets without discovery, and neared the wharf where the rebels lay all unconscious. I now thought that it might be better to board and "take her alive," having in the two boats twenty men well armed with revolvers, cutlasses and hand grenades. To be sure there were thousands near by and ten times

our number on the ship, but a surprise is everything and I thought that if her fasts were cut at the instant of boarding we might overcome those on board, take her into the stream and use her iron sides to protect us after, from the forts. Knowing the town I concluded to land at the lower wharf, creep around and suddenly dash aboard from the bank, but just as I was sheering in close to the wharf a hail came sharp and quick from the iron-clad, in an instant repeated. I at once directed the cutter to cast off and go down to capture the guard left in our rear, and ordering all steam, went at the dark mountain of iron in front of us. A heavy fire was at once opened upon us, not only from the ship, but from men stationed on the shore, but this did not disable us and we neared them rapidly. A large fire now blazed up on the bank and by its light I discovered the unfortunate fact that there was a circle of logs around the *Albemarle,* boomed well out from her side, with the very intention of preventing the action of torpedoes.

To examine them more closely I ran alongside until amidship, received their fire and sheered off, for the purpose of turning, a hundred yards away and going at the booms squarely. This was my only chance of success and even if my boat were forced over the obstruction it could never get out again. But I was there to accomplish an important object and to die if needs be was but a duty. As I turned the whole back of my coat was torn out by buck shot and the sole of my shoe was carried away. The fire was very severe. In a lull of the firing the captain hailed us, again demanding what boat it was. All my men gave some comical answer and mine was a dose of canister which I sent amongst them from the howitzer, buzzing and singing against the iron ribs and into the mass of men standing fire-lit upon the shore .

In another instant we had struck the logs and were over, with headway nearly gone, slowly forging up under the enemy's quarter port. Ten feet from us the muzzle of a rifle gun looked into our faces and every word of command on board was distinctly heard.

Four more bullets now ploughed through my clothing in quick succession as I stood in the bow, the heel jigger in right hand and exploding line in left.

We were near enough then and I ordered the boom lowered until the forward motion of the launch carried the torpedo under

the ram's overhang. A strong pull of the detaching line, a moment's waiting for the torpedo to rise under the hull, and I hauled in the left hand just cut by a bullet. The explosion took place at the same instant that one hundred pounds of grape at ten-feet range crashed in our midst and the dense mass of water thrown out by the torpedo came down with choking weight upon us. Twice refusing to surrender, I commanded the men to save themselves and throwing off sword, revolver, shoes and coat, struck out from my disabled and sinking boat into the river. It was cold, long after the frosts and the water chilled the blood while the whole surface of the stream was ploughed up by grape and musketry and my nearest friend was twelve miles away, but anything was better than to fall into rebel hands.

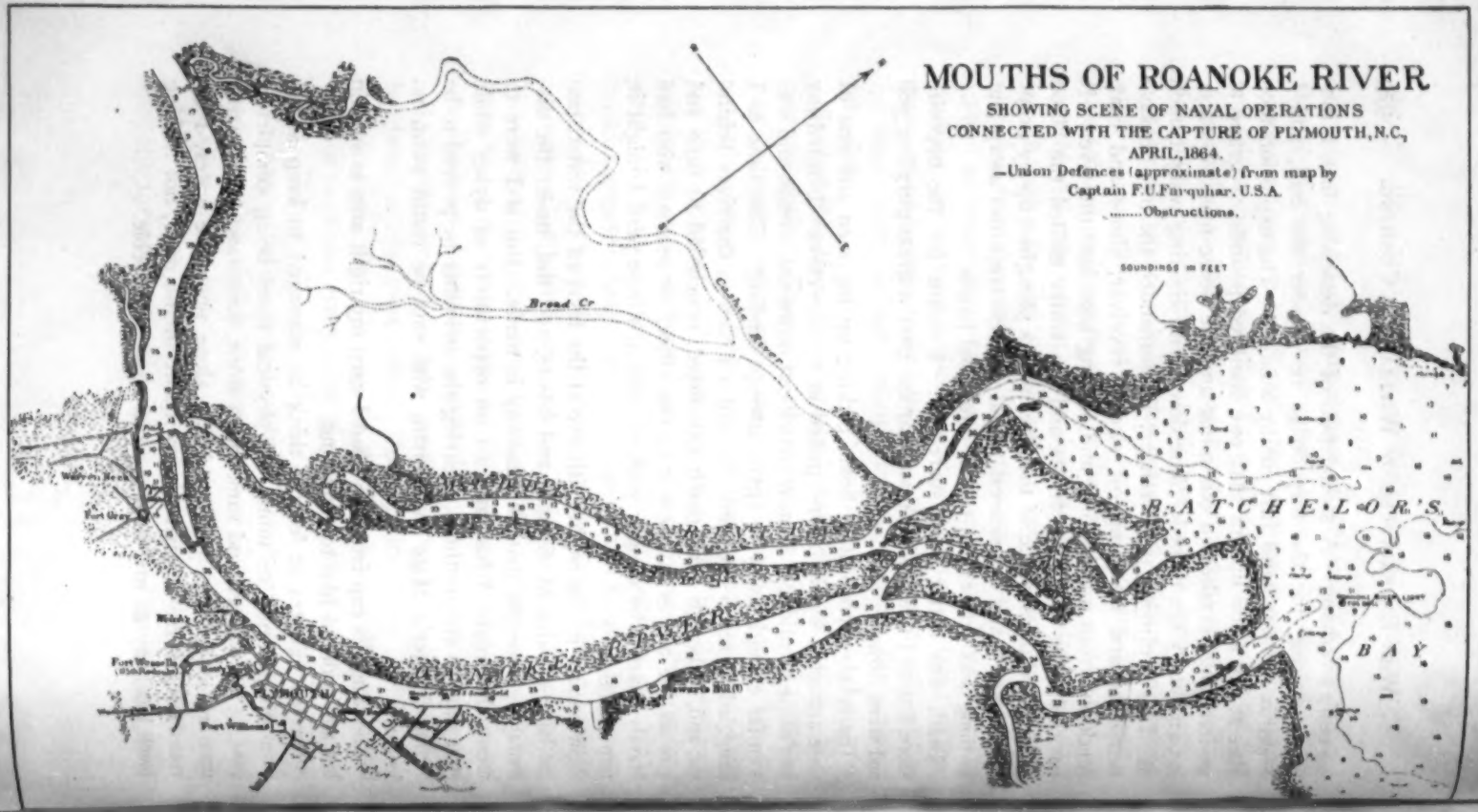
Death was better than surrender. I swam for the opposite shore, but as I neared it a man near me gave a great gurgling yell and went down.

The rebels were out in boats picking up my men and one of these attracted by the sound pulled in my direction. I heard my own name mentioned. I now struck out down the stream and was soon far enough away to again attempt landing. This time as I struggled to reach the bank I heard a groan in the river behind me, and, although very much exhausted, concluded to turn and give all the aid in my power to the officer or seaman who had bravely shared the danger with me and in whose peril I might in turn partake.

Swimming in the night with eye at the level of the water, one can have no idea of distance and labors, as I did, under the discouraging thought that no headway is made. But if I were to drown that night I had at least an opportunity of dying while struggling to aid another. Nearing the swimmer he proved to be Acting Master's Mate Woodman, who said he could swim no longer.

Knocking his cap from his head I used my right arm to sustain him and ordered him to strike out.

For ten minutes at least I think he managed to keep afloat, when his presence of mind and physical force being completely gone, he gave a yell and sank like a stone, fortunately not seizing upon me as he went down. Again alone upon the water, I directed my course toward the town side of the river, not making much headway as my strokes were now very feeble.


MOUTHS OF ROANOKE RIVER
SHOWING SCENE OF NAVAL OPERATIONS
CONNECTED WITH THE CAPTURE OF PLYMOUTH, N.C.,
APRIL, 1864.
—Union Defences (approximate) from map by
Captain F.U.Farquhar, U.S.A.
.....Obstructions.
SOUNDINGS IN FEET
Broad Cr
Cashie River
Albemarle
River
Roanoke River
Batchelor's
Bay
Fort Gray
Fort Wessells
Fort Williams

My clothes were soaked and heavy and little chop seas splashed with a choking persistence into my mouth every time I gasped for breath. Still there was a determination *not* to sink, a will *not* to give up, and I kept up a sort of mechanical motion long after my bodily force was in fact expended.

At last, and not a moment too soon, I touched the soft mud and in the excitement of the first shock I half raised my body and made one step forward, then fell and remained half in the mud and half in the water until the daylight, unable even to crawl on hands and knees, with brain in a whirl and nearly frozen but with one thing strong in me, the fixed determination to escape. The prospect of drowning, starvation, death in the swamps, all seemed lesser evils than that of surrender. As day dawned I found myself in a point of swamp that enters the suburbs of Plymouth and not forty yards from one of the forts. The sun came out bright and warm, proving a most cheering visitant and giving me back a great portion of the strength of which I had been deprived before.

Its light showed me the town, swarming with soldiers and sailors, who moved about in an excited manner as if angry at some sudden shock. It was a source of satisfaction to me to know that I had pulled the wire that set all these figures moving in a manner quite as interesting as the best of the theatricals, but as I had no desire to be discovered by any of the dogs that were so plentiful around me, I did not long remain a spectator.

My first object was to get into a dry fringe of rushes that edge the swamp but to do this required me to pass over thirty or forty feet of open ground right under the eye of the sentinel who walked the parapet. Watching, until he turned for a moment, I made a dash to cross the space, but was only halfway over when he turned and forced me to drop down right between two paths and almost entirely unshielded.

Perhaps I was unobserved because of the mud that covered me and made me blend in with the earth. At all events the soldier continued his tramp for some time while I, flat on my back, waited another chance for action. Soon a party of four men came down the path at my right, two of them being officers, and passed me so close as to almost tread upon my arm. They were conversing about the events of the previous night and wondering how it was done, entirely unconscious of the presence of one who could give them the information. This proved to me the necessity of re-

gaining the swamp, which I did by sinking my heels and elbows into the earth and forcing my body inch by inch toward it. For five hours then, with bare feet, head and hands, I made my way, where I venture to say none ever did before, until I came at last to a clear place where I might rest upon solid ground. The cypress swamp was a network of thorns and briers that cut into the flesh at every step like knives and frequently when the soft mire would not bear my weight I was forced to throw my body upon it at length and haul along by my arms. Hands and feet were raw when I reached the clearing and yet my difficulties were but commenced. A working party of soldiers was in the opening engaged in sinking some schooners in the river to obstruct the channel. I passed twenty yards in their rear through a corn furrow and gained some woods below. Here I encountered a negro and after serving out to him twenty dollars in greenbacks and some texts of Scripture (two powerful arguments with an *old* darkey), I had confidence enough in his fidelity to send him into town for news of the ram. When he returned and there was no longer doubt that she had gone down, I went on again with a light heart and again plunged into a swamp so thick that I only had the sun for a guide and could not see ten feet in advance. About 2 in the afternoon I came out from the dense mass of weeds upon the bank of one of the deep, narrow streams that abound there and right opposite to the only road in that vicinity.

It seemed Providential that I should come just there for thirty yards above or below and I never would have seen it and might have struggled on until worn out and starved and found a never-to-be-discovered grave. As it was my fortune had led me to where a picket party of seven soldiers were posted, having a little flat bottomed, square-ended skiff, toggled to the root of a cypress tree that squirmed like a snake into the inky water. Watching them until they went back a few yards to eat, I crept into the stream and swam over, keeping the big tree between myself and them and making for the skiff.

Gaining the bank I quietly cast loose the boat and floated behind it some thirty yards, around the first bend, where I got in and paddled away as only a man could where liberty was at stake. Hour after hour I paddled, never ceasing for a moment, first on one side then on the other, while sunshine passed into twilight and that was swallowed up in thick darkness only relieved by the

few faint star rays that penetrated the heavy swamp curtain on either side.

At last I reached the mouth of the Roanoke and found the open sound before me.

My frail boat would not have lived a moment in the ordinary sea there, but it chanced to be very calm, leaving only a slight swell which was, however, sufficient to influence my boat so that I was forced to paddle all upon one side to keep her on the intended course. After steering by a star for where I thought the fleet might be for, perhaps, two hours I at length discovered one of the vessels and after a long time got within hail.

My "Ship ahoy!" was given with the last of my strength, and I fell powerless with a splash into the water in the bottom of my boat and awaited results. I had paddled every minute for twelve successive hours and for four my body had been "asleep" with the exception of my two arms and brain.

The picket vessel *Valley City*, for it was she, upon hearing the hail at once slipped her cable and got under way at the same time lowering boats and taking precaution against torpedoes. It was some time before they would pick me up, being convinced that I was a rebel conductor of an infernal machine, and that Lieutenant Cushing had died the night before.

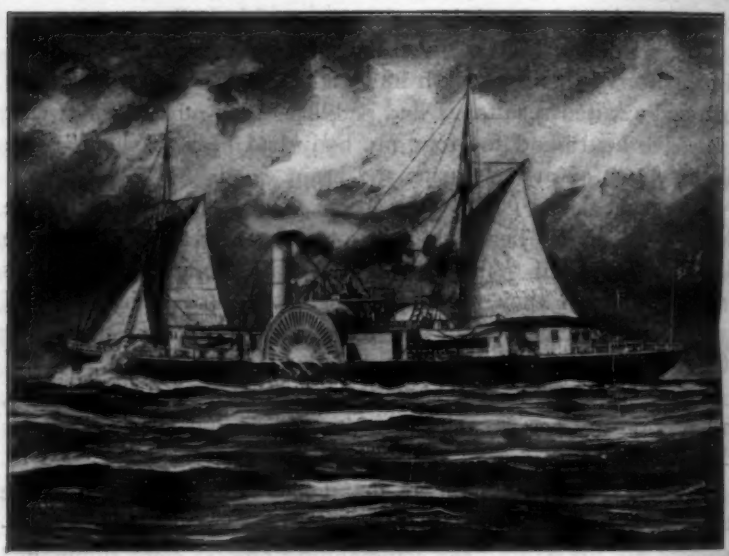
At last I was on board, had imbibed a little brandy and water, and was on my way to the flag ship commanded by Commander Macomb.

As soon as it became known that I had returned, rockets were thrown up and all hands called to cheer ship and when I announced my success, all the commanding officers were summoned on board to deliberate upon a plan of attack. In the morning I was again well in every way with the exception of hands and feet and had the pleasure of exchanging shots with the batteries that I had inspected on the day previous.

I was sent in the *Valley City* to report to Admiral Porter at Hampton Roads and soon after Plymouth and the whole district of the Albemarle, deprived of the iron-clad's protection, fell an easy prey to Captain Macomb and our fleet. I again received the congratulations of the Navy Department and the Thanks of the Congress of the United States. I was also promoted to the grade of lieutenant-commander. The testimonials that I received from the Chamber of Commerce, cities, Union League Clubs, etc., were

numerous and gratifying. I was at this time twenty-one years of age, having had my first command at nineteen. The *Albemarle* was built like the famous *Merrimack* and in her contests with our ships successfully resisted solid hundred-pounder Dahlgren and Parrott shot at ten yards' range.

In November, 1864, I assumed command of the flagship *Malvern* bearing the broad pennant of Rear-Admiral David D. Porter. A large fleet was collected in Hampton Roads and it was known that Wilmington was the point of attack.



UNITED STATES FLAGSTEAMER MALVERN.

A combined army and navy movement was made against Fort Fisher in December and resulted in a failure, in consequence of the generalship of General B. F. Butler, who would not assault, after a bombardment from the ships that kept the weak and surprised garrison so effectually in their bomb-proofs that their flag was taken openly down the beach in the broad sunlight.

The indignation of army and navy at this inexcusable conduct of Butler's was openly and loudly expressed and we all rejoiced when another attack was ordered under a man who would not permit great egotism and a jealous temper to make him blind to his duty as a soldier. In the first attack I took my gig and went

in on the bar to sound and put down buoys. I was six hours upon this dangerous duty and congratulate myself that we were not blown out of water. Round shot, shell and shrapnel ploughed around us every moment, and I actually had to bail out the water that was thrown into the boat by them. A cutter assisting us was sunk by the severe fire.

There is no doubt that this was the most dangerous service rendered during the day. This was the scene of the famous Powder Boat Explosion. I was sounded in Washington by Mr. Fox as to my willingness to perform the service of firing the powder and at once consented to do so as I had, early in the war, to the taking in of a powder ship to Sumter for the same purpose. But afterward Commander Rhind was placed in command of the expedition which failed from no fault of his. The day after the withdrawal of the troops a volunteer lieutenant, commanding an armed prize, came around from the Western Bar and reported that he had been chased away by a rebel privateer loaded down with men and protected by cotton bales. The admiral at once sent for me and did me the honor to propose that I should capture her, giving me again command of my old favorite, the *Monticello*, for that purpose. Steaming around the shoal as rapidly as possible, I found the vessel described at anchor inside the bar under the guns of Fort Caswell and fired a blank cartridge as a challenge. This did not draw her out, nor did the subsequent destruction of a large blockade-running steamer which I drove ashore under the batteries in her attempt to get in. In this service my ship was hulled six times. The *Chickamauga* would not fight, probably suspecting some Yankee trap, whereas, nothing was desired by us but a fair field and no favor. With her extra men aboard she was much the stronger and might better have finished her career in a gallant action on the ocean than in the way she did, sunk by a retreating crew in Cape Fear River.

On the twelfth of January everything being ready the attack was resumed against the forts of Wilmington. These mounted nearly a hundred heavy guns and, warned by Butler's fiasco, were garrisoned by over three thousand veteran soldiers. The ships, sixty in number, advanced in beautiful order, the iron-clads taking the lead and followed by the heavy frigates, after which in turn came sloops of war and gunboats. The fire from the fleet was terrific and soon drove the enemy into shelter. For three days

the bombardment continued, in which time most of the opposing guns were disabled and the time came for assault. On the morning of the fifteenth, the admiral observing the *Chickamauga* and some other steamers maneuvering to reinforce the forts inside, ordered me to drive them away. In order to do this I ran my wooden vessel inside of the iron-clad line and all other ships nearest to Fort Fisher, where I moored head and stern and opened fire upon the steamers with my one-hundred pounder Parrott and with broadside guns upon the fort. After driving these vessels from position the fire was continued upon the embrasures.

About 2 in the afternoon, I landed with forty men to join the assaulting body of sailors and marines who were to storm the sea front of the fort. These were fourteen hundred in number, the officers all in uniform, bright with gold lace and every man dressed as for inspection. All were armed with cutlass and revolver alone, excepting the marines, who carried muskets and were to cover us in scaling work.

Wheeling from column into line, we marched up by the flank to within four hundred yards of the frowning fort and lay down under the slope of sand beach until the signal for assault should come from the army, who were to advance from the other side.

Lieutenant Ben Porter and myself massed our men and agreed to lead the assault, bearing with us the admiral's blue flag. In the meantime, while we waited, the whole fire of the navy passed a few feet over our heads. Such a hell of noise I never expect to hear again. Hundreds of shell were in the air at once, varying from the five hundred-pounders of the iron-clad to those of a half and fourth of that weight, but all shrieking in a grand martial chorus that was a fitting accompaniment to the death dance of the hundreds about to fall. At last the signal came and we were up in an instant, advancing steadily, until within a hundred yards and then bursting forward with a cheer from the whole line.

The beach to be gone over was level white sand into which we sank, ankle deep, and which in the bright sunlight made targets of us all from contrast. The rebels, meanwhile, were not idle, but thinking ours the main storming party, massed against us and sent a staggering fire into our ranks that ploughed through with deadly effect and never ceased for an instant. We gained the palisades only to find further advance impossible and all were

brought to a halt. Thinking that I saw an opening I sprang forward and had proceeded some distance when upon looking behind me I perceived that I was not followed, so I went down in the sand for shelter.

In a moment I heard the voice of one of my men crying out, "Captain Cushing! They are retreating, sir!" and upon looking around I saw the whole line breaking and going backward. A hundred yards was now between myself and the retreating force, and I was close under the muzzle of the Confederate rifles, but I made up my mind that it was my duty to join my men and rally them, so I sprang to my feet amidst what can only be called a storm of bullets and passed unharmed to our force. That retreat was a fearful sight. The dead lay thickly strewn along the beach, and the wounded falling constantly called for help to their comrades and prayed to God that they might not be left behind. I saw the wounded stagger to their feet all weak and bloody, only to receive other and more fatal wounds, and fall to rise no more. Our attempt had the good result of diverting the rebel attention from the army who surprised their rear and gained a hold upon their traverses, a seizure that was gradually increased until all was in our possession. Noble Ben Porter had met his death early in our assault as well as Lieutenant Preston and many of the officers had remained under the palisades of the fort until it should be dark. Amongst these were most of the ranking officers, including Fleet Captain Breese, who commanded the attack. I, therefore, assumed command and after intense exertion and fatigue succeeded in collecting a few hundred men with whom I again proceeded to assault when I was met by an aid of General Terry, who requested me to place my men in the intrenchments in front of Bragg's army that was about to attack us from the rear.

This I did, relieving a regiment which went in fresh to General Terry's assistance. At 10 that night the entire rebel force surrendered. In the intermediate time, between the assault and the surrender, the tide had risen and drowned many of our wounded who fell upon the beach and swept off into the remorseless ocean the hero clay of many a gallant sailor. How few realize at what a cost our nation's unity has been purchased! On the 16th I was ordered around to the West Bar on a reconnoissance of the forts there. Anchoring my ship, I pulled in with five men and an officer in my gig to demand the surrender of Fort Caswell. Finding it

abandoned I hoisted the American flag and proceeded to take possession of several other batteries in the vicinity. Pushing on up to Smithville, I received the surrender of the town from the mayor and hoisted our flag on the fort, capturing there large quantities of arms and provisions.

Rebel cavalry were in the streets but I took possession of a building at the end of the wharf and loading a lot of muskets remained there with four men while I sent away two sailors with darkey boats' crews, one out of my ship, for reinforcements, and the other up through the river to Fisher to notify the admiral. That night I had two hundred sailors ashore and established myself as military governor. Our first act was to seize the men who had piloted blockade runners over the bar. These I promised to hang but finally concluded to spare them if they hoisted upon Oak Island the signal lights by which ships ran in and out.

My threat had its effect and the lights were stationed while I prepared boats for boarding any such vessels as might be decoyed into our trap.

On the night of the twentieth a large steamer came over the bar and made the private signals to Fort Caswell. Of course these could not be answered, but my officer as directed hailed her and said that all was right, that the signal corps was withdrawn to Smithville. Upon this she came up and anchored.

When we boarded and informed the captain that his vessel was a prize, he was not the only one astonished. A champagne supper was in progress in honor of successfully running the blockade at which several English army officers were making merry, confident that they were in the friendly and hospitable bosom of the Southern Confederacy.

As we sat down amongst them and ordered the steward to bring another case of champagne, their tongues loosened and one in accents of English disgust, exclaimed, "Beastly luck!" "A most unmitigated sell!" responded number two.

Aye, gentlemen, and may you never meet better luck on the same errand! This was the steamer *Charlotte*, loaded with arms and machinery, and reported one of the fastest in the trade. Ten minutes later the Confederate steamer *Stag* came in, loaded down with a valuable cargo and was captured in the same manner. But, while the plan and credit of success were all mine, it was not so with the prize money. The *Malvern* and several light ves-

sels came down that very evening and being within signal distance were entitled to claim equal shares with us.

On the night of the fifth of February, with fifty men in three boats, I entered Little River, the same place where I previously stormed the battery, and proceeded with muffled oars to the small town of All Saints Parish, South Carolina. Landing in the fog and taking a negro for a guide I soon had all the houses under guard without the knowledge of a single one of the inhabitants. Proceeding to a Confederate cotton storehouse I seized the contents.

In the morning the good townspeople were considerably astonished to find a blue jacket and musket at every door. As no one escaped we remained there quietly all day, enjoying the poultry and sweet potatoes that South Carolina furnished and capturing such mails and soldiers as came along.

At night we drew off with our prizes without an attack from any of the bodies of soldiers in the immediate vicinity. Knowing that the news of our visit would draw forces from the inlets near by, we organized an expedition for the capture of a Confederate storehouse three miles back of Shallotte Inlet.

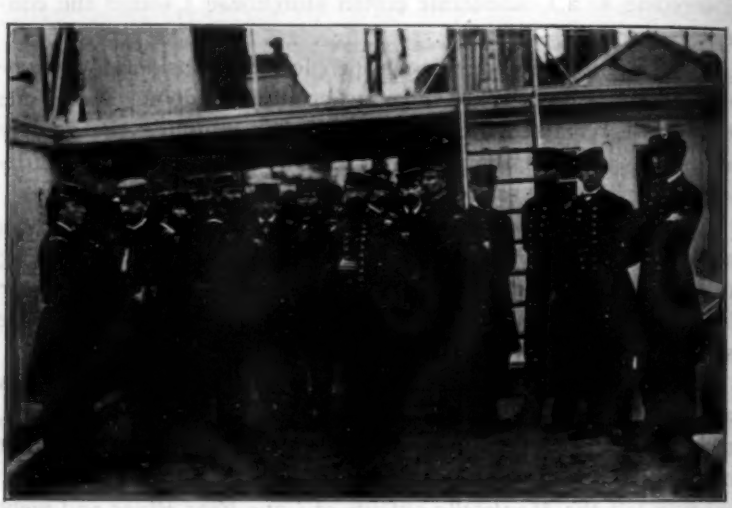
Here were collected corn and bacon for the Confederate forces at Wilmington. We surprised and captured it with fifty men, taking prisoners eight of the guard, and burning everything that could not be brought away in captured carts.

I now left the *Monticello* outside of Cape Fear River and went on board the flagship *Malvern* near Fort Anderson, which the navy was about to attack.

Here, several nights in succession, I went up close under the guns of the rebel fort, to examine the obstructions and torpedoes and once pulled with my brother, Paymaster Cushing, in company close up to the city. One night while I was on this duty I found a band of music playing in Anderson and speeches being made by enthusiastic Confederates who were picturing in glowing terms the victories of the chivalrous South and heaping whole continents of scorn upon the base and cowardly North.

The Confederacy was about to tumble but they were blind to the fact. Their armies were all beaten but one southerner was still the sure conqueror of five Yankees. It was bright moonlight and I enjoyed the music in which the bombast was sandwiched exceedingly, but at length could not resist the temptation

of sending a bullet amongst the crowd as a period to the speech making, at the same time consigning them with a shout to a place somewhat warmer than Dixie. I succeeded in astonishing them, but the way the grape shot flew around for a while from their guns was far from pleasant. Their discipline was evidently good. Every night that I went up after this I carried on my observations to the music of rebel round shot, but night firing is very inaccurate and their ammunition was wasted.



REAR-ADMIRAL PORTER AND STAFF ON THE U. S. S. " MALVERN," DECEMBER, 1864.

Cushing, commanding the *Malvern,* is at extreme left of picture with cape folded on his right arm.

In consequence of a formidable line of obstructions, and a quantity of torpedoes in front of this fort, it was decided unsafe to attempt running the fleet by its guns, and until that *should* be done it had free communication with the city above. Our army was closing in upon its rear but could not command the river, and it became necessary for the navy to act. I, therefore, proposed to Admiral Porter the construction of a mock *Monitor,* such as was used by him upon the Mississippi River, and at once proceeded to construct it out of an old flat boat and some canvas. When complete it was not possible to distinguish between it and the real one near by at two hundred yards' distance.

The tide there runs at about five knots speed and it was to be the motive power. Weighting one end of my iron-clad much heavier than the other so as to take it straight up with the tide, I towed her up to within two hundred yards of the opening of the obstructions and cast adrift.

Up the river with the flood tide she went, apparently steaming and in spite of everything passed successfully.

The consequence was that the commanding Confederate, knowing that the army was closing in behind him, and thinking a *Monitor* in the river above, evacuated in such haste as to leave the fourteen heavy guns unspiked and magazine intact.

We took possession the next morning. Confederate officers told me afterward that this was the true reason for their retreat, and swore like pirates at the imposition.

I was soon after ordered up to Norfolk to fit a torpedo upon my ships's bows to encounter the anglo-rebel iron-clads expected from Europe, but after making ready found that I was to be disappointed by their non-appearance.

Just as the bottom of the rebellion fell out at Richmond, I was detached and granted leave of absence.

NOTE.—In the preceding issue of the PROCEEDINGS OF THE U. S. NAVAL INSTITUTE the article entitled "William Barker Cushing" should be read with the following additions or corrections:

The aunt with whom Cushing was visiting in Washington in January, 1861, was his aunt Mrs. Fannie Cushing of whom he was very fond.

Cushing received a slight abrasion of the left hand at the time of sinking the *Albemarle*.

Cushing was born in Delafield, and his sister Isabel was born in Chicago.

Congressman Edwards was not a kinsman of Cushing but a friend who loved him as a son.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

CONTROL OF THE SEA: ITS RELATION TO THE RUSSO-JAPANESE WAR.*

By MIDSHIPMAN GEORGE C. MANNING, Class of 1914, U. S. N. A.

Motto: "All depends on the command of the sea."

In spite of the tremendous impression which Admiral Mahan's works about the influence of sea power on history have made upon the minds of the thinking public, many people look upon the late war between Russia and Japan as a war in which the navy counted for little. Although this noted tactician has shown that every war of consequence has been won by that nation which secured control of the sea, and that this victory was the direct result of control of the sea, few see the application of this law in the Russo-Japanese war. Notwithstanding the fact that eminent military and naval critics have expressed an opinion to the contrary, many of us lay the blame of Russia's defeat upon General Kuropatkin. The facts of the matter are that, although the Russian general was undoubtedly a greater strategist than his opponents, he was defeated because of a lack of assistance on the part of the navy.

General Kuropatkin said in a letter to his sovereign that he would gladly assume all the responsibility for his country's defeat, but that this would be historically untrue. In an article in *McClure's* he made the following statement which throws some light on the previous assertion:

> In the war with Japan the chief place belonged to operations on the sea; not to those on the land. If we had smashed the Japanese fleet, the war on Chinese territory would have become an impossibility for the Japanese. As a matter of fact, our fleet helped the land forces very little indeed. Our fleet did nothing to hinder the Japanese from bringing up all sorts of stores, guns, ammunition, and materials.†

*The medal offered by the Admiral Trenchard Section, No. 73, Navy League of the United States, to midshipmen of the 3d and 4th classes, for the best essay on a topic either naval or patriotic in character, was awarded June Week, 1912, for this essay.

†General Kuropatkin: The Causes of Russia's Defeat by Japan. *McClure's Magazine*, Vol. 32, p. 215.

These are the facts of the case in a nutshell, but they may not be self-evident. We are not willing to grant this importance to the navy without proof. We demand that we be shown. To say that without control of the sea at the beginning of the war Japan would not have been able to attack Russia in Manchuria, is well enough. To maintain that without control of the sea throughout the war Japan would not have been able to prosecute a war, is all right, too. We want proof.

Let us begin with facts that are axiomatic, indisputable. In the first place, Japan is an island, or rather a series of islands. She is separated from China by bodies of water too wide to jump and too deep to wade, across which there are no bridges. If men and munitions of war are to be transferred from Japan to the mainland of Asia, they must be sent on ships. Now, let us assume for the time being that Japan has not unquestioned control of the sea, but that the opposing forces are about evenly matched and that the control has not yet been decided. Vessels conveying soldiers and stores are not armed. Every time one of these ventures out of a Japanese port, unless escorted by the entire fleet, she stands a good chance of being captured by the enemy. Had Russia's fleet in Asiatic waters been able to dispute the control of the sea with Japan, the latter nation would have found it extremely difficult (if not altogether impossible) to transport the men and supplies necessary to maintain such a gigantic struggle as the war between Russia and Japan.

But, of course, such a condition of affairs could not continue long. Let us suppose that in the battle settling the supremacy on the deep the Russian fleet had defeated her antagonist. In other words, let us assume that Russia had had control of the sea and the Japanese war vessels were driven to fortified harbors. Would Japan then have been able to reinforce her armies and furnish them with the necessary munitions of war? If Russia had control of the sea her fleet would be able to blockade the Japanese ports. The only supply vessels that could reach Japan's struggling legions in Manchuria would be such as managed to slip past the blockading squadron. If she had no army in China, it is evident that with her ports blockaded she would not be able to send one there. If she did have an army in Manchuria, she would be unable to send it supplies or reinforcements. This army, unable to retreat and cut off by sea from its base, would be in a very embarrassing position, and compelled to surrender without being able to strike

a blow at the enemy, for without cartridges and food men cannot fight.

But this imaginary state of affairs did not prevail in the east when Japan attacked Russia, or at any time during the war. From February 8, 1904, when Japan struck the first blow until hostilities were closed by the Treaty of Portsmouth, Japan's control of the sea was perfect and complete. There never was a time when there was any doubt who was master of the Japan Sea. It is to this and to this alone that the yellow man owes his tremendous victory over the Russian bear.

Just previous to the opening of hostilities, Russia seemed to be indifferent, careless. Her head men thought it impossible that Japan should declare war against her. Therefore, instead of concentrating the larger part of her naval forces in Asiatic waters, she was content to leave there only her regular Asiatic squadron. It seems impossible, looking at the war to-day, that Russia could have been as blind to the prospects of war as she was. The Japanese were ready for war, looking forward to it. On the 9th of February, 1904, the protected cruiser *Varyag* and the gunboat *Coreetz* saw transports under escort of a powerful squadron of Japanese war vessels unload the nucleus of an army, and a large amount of supplies. These surely were sufficiently warlike preparations to warn them that it was no time for listlessness. Still Captain Togo says of them: * "The Russian ships behaved with the utmost unconcern; their washing was hanging out to dry, and their swinging booms out as if they were wholly indifferent to the great drama about to be enacted. What must have been their amazement when they found we were prepared for action, our gunners coming up on deck with their gloves for loading. Perhaps, however, they did not know what to make of this." Even if the Russian fleet in the Asiatic waters had been equal to that of the Japanese, it would have been defeated just as surely if the officers had made no more preparation for the struggle than they did. To bring a war to a successful termination needs, above everything else, preparation, readiness.

It must be remembered, moreover, that in discussing the relative strength of the Russian and Japanese naval forces in the east, several things must be taken into account which cannot be set down in figures, but which in reality often count for more in winning battles than guns and armor. Any armor is sufficient to

* Captain Togo: Naval Battles of the Russo-Japanese War, p. 7.

protect a ship from shots that never hit. A 6-inch shell that hits does more damage to the enemy than a million 12-inch shells that merely splash the water. Having practically no outlet to the sea the Russians are not sea-going, as are the Japanese, for their life is intimately connected with the sea. The ability of the Japanese sailors was greater than that of the Russian seamen. In all their engagements the little yellow men proved themselves much better marksmen than their opponents. In a word, "the man behind the gun" on the Japanese vessels, was both naturally, and on account of his better training, superior to his adversary on the Russian ships of war. Moreover, the Japanese seemed moved by a consuming love of country, which we cannot help admiring. On the other hand, in too many instances the Russian sailors were not only highly indifferent, but actually anxious to keep out of the fight. Men who fight in a war simply because the czar says so, feeling no personal interest in the matter one way or the other, do not have the same interest, the same eagerness to win that men have who feel that they are fighting their own cause, for their own homes and loved ones. Then, again, the Russians were so over-confident that they did not think it worth while to make tremendous preparations and sacrifices for this conflict. They thought they could win without much trouble if Japan was so foolish as to declare war. "Why, therefore, inconvenience ourselves?" they asked.

All these conditions contributed to give Japan absolute control of the sea. A comparison of forces at the seat of war shortly before February 8, 1904, will show, moreover, that had the Russian bluejackets been as good men as their opponents, and had they been animated by as consuming an enthusiasm, the victory would most likely have been to the Japanese. In battleships, the squadrons were about equal with a slight advantage to the Japanese. The eight Japanese battleships had an aggregate tonnage 95,517, and armament of twenty-eight 12-inch and eighty-eight 6-inch guns. The tonnage of Russia's eight battleships was 92,048, and their armament twenty 12-inch, twelve 10-inch and eighty-nine 6-inch guns.

In cruisers, however, both armored and protected, the Japanese had an enormous advantage. The tonnage of the three Russian armored cruisers was 35,540, and their armament twelve 8-inch, forty-eight 6-inch, and six 4.7-inch guns. Japan had nine armored cruisers with a tonnage of 76,022, and an armament of thirty-two

8-inch, one hundred and eight 6-inch, and ten 4.7-inch guns. The Russian protected cruisers, six in number, had an aggregate tonnage of 35,390, and were equipped with fifty-four 6-inch, and six 4.7-inch guns. This squadron looks little beside Japan's squadron of seventeen protected cruisers armed with three 12.6-inch, four 10-inch, eight 8-inch, forty-one 6-inch, and one hundred and seven 4.7-inch guns, and having a total tonnage of 61,843. But whether these facts are sufficient to show that the Japanese naval forces in the vicinity of Korea were stronger than the Russian forces, it is indisputable that the Russian vessels made not a single movement to prevent the Japanese from transporting to the mainland of Korea a large number of troops and an enormous amount of supplies.

It seems as though the Japanese perceived more clearly than anyone else the absolute necessity of perfect control of the sea, for they made no formal declaration of war. They struck the first blow, and got in a good one too, for by it they made it absolutely certain that their fleet should be larger than that of their enemies. Their first blow was not against a land fortification, an attempt to render some stronghold untenable. It was directed against Russia's naval forces in the east. One week after the opening of hostilities that comparison of forces cited above was not still true. Japan, indeed, still possessed all that she had had at the beginning, but Russia had lost two battleships, three cruisers, and one gunboat, destroyed or injured beyond further usefulness, and the rest were afraid to leave port. On the 13th of April the battleship *Probieda* was hopelessly damaged and the *Petropavlorsk* ran upon a mine and was entirely destroyed with the loss of Admiral Makaroff. The loss of this eminent tactician was even a more serious blow to the Russian navy than the loss of the battleships. It settled it for good and all that Japan's navy was supreme in the east. Her transports and supply ships were at liberty to convey supplies and troops to the struggling armies in China, without liability to capture by their enemies.

Not only at the beginning, but throughout the entire war, Japan had absolute control of the sea. In every naval battle the Russians were outnumbered, outclassed and hopelessly defeated. In an attempt to break the blockade at Port Arthur, August 10, 1904, the Russian squadron was at first successful. Owing, however, to the death of the admiral (Withoeft) and the incompetence of his successor, the ships fell into confusion and retreated back into

Port Arthur where they were so closely held that they took no further part in the war.

In an engagement off Ulsan, August 14, 1904, Russia's three armored cruisers in the Vladivostok squadron were opposed by four armored cruisers, four protected cruisers, and a torpedo-boat flotilla. This engagement was marked by the skillful maneuvering of both forces, but the Japanese vessels sank the *Rurik*, and put the other two, the *Rossia* and the *Gromboi*, to flight by their superior forces and more accurate shooting.

In the tremendous effort made by Russia to break Japan's control of the Asiatic waters by putting a fleet in the east practically equal to the Japanese forces, she met with a miserable failure. A comparison of the fleets engaged in the battle of the Sea of Japan will show that Russia did indeed succeed in placing a fleet in the east nominally the equal of the Japanese combined fleet. Russia had the superiority in battleships, eight with a tonnage of 94,804, and an armament of twenty-four 12-inch, seven 10-inch, four 9-inch, and seventy-seven 6-inch guns, against Japan's four with a tonnage of 57,550, and twelve 12-inch and fifty-two 6-inch guns. But in cruisers and coast defense ironclads Japan had the advantage. Russia had nine cruisers and three coast defense ironclads of 59,143 tons, and three 10-inch, eight 9-inch, fifty-seven 6-inch, and forty-four 4.7-inch guns against Japan's eight armored cruisers and fifteen protected cruisers of 131,625 tons, and three 12.6-inch, four 12-inch, four 10-inch, thirty-six 8-inch, one hundred and forty-eight 6-inch, and eighty-nine 4.7-inch guns. The entire Russian fleet was, therefore, of 153,947 tons and had an armament of twenty four 12-inch, ten 10-inch, twelve 9-inch, one hundred and thirty-four 6-inch, and forty-four 4.7-inch guns. This fleet was opposed to one of 189,175 tons, which had an armament of three 12.6-inch, sixteen 12-inch, four 10-inch, thirty-six 8-inch, two hundred and six 6-inch, and eighty-nine 4.7-inch guns.

The fleets were, therefore, not unevenly matched in point of guns and ships, although the figures do show a slight advantage in favor of the Japanese. In accuracy of fire, in the spirit which animated the crews, in the condition of ships and men, in the speed which the fleets could maintain, in knowledge of their ground, there was no such equality or anything approaching equality. It was due to these things that the yellow men accomplished such a wonderful victory at Tsushima and destroyed Russia's hopes of bringing the war to a successful issue. Russia had accomplished

a remarkable feat in sending the Baltic fleet a distance of 13,000 miles to the scene of the war, and keeping it supplied with coal and other necessities in spite of the restrictions imposed by the neutrality of the ports at which the fleet stopped. The fleet arrived in such a condition, however, that it could not withstand the vigorous attack of the Japanese fleet.

This battle settled the control of the sea and the result of the war. It showed that when Japan took the bull by the horns and seized control of the sea before Russia woke up to the fact that war was on, the war was won. Russia might send a fleet from the west to regain control of the eastern waters, but she was sending a fleet to defeat and destruction. Many "level-headed" people considered sending our fleet around South America in time of peace a very hazardous undertaking. To send a fleet around Asia and Africa in time of war, with all the restrictions imposed upon the fleet by the neutrality of the countries through which it was passing, was practically impossible if the fleet was to arrive at the scene of war in condition for making the fight of its existence. Japan was fully assured of her control of the sea. She could continue her operations on land without fear of interruption.

But apart from the fact that the Japanese victories on land were all due indirectly to control of the sea, since without this supremacy she could never have put an army in Manchuria, control of the sea was directly responsible for several of the victories of the Japanese army. It was the work of the Japanese navy, not that of their army, in several battles which defeated the Russian army. At Turrentchen, on May 1, Japanese vessels steamed up the Yalu River and opened fire upon the Russian forces, compelling them to retreat at the moment of victory. It was the defeat of a small squadron sent from Port Arthur by a larger Japanese force that made possible the occupation of the Liotung peninsula by the Japanese and put the Russian stronghold in a state of siege.

At Kin Tcheu the Russian army was compelled to evacuate a position heretofore considered impregnable, due to the work of the Japanese navy. The rapid and accurate fire poured in upon the flank of the Russian forces rendered the position untenable.

In his final order on the dispersal of the combined fleet of Japan, Admiral Togo said: "Heaven gives the laurels of victory in war to those only who keep themselves in training in time of peace, and *win the battle before it is fought.*"* This is what Japan did in the Russo-Japanese war. When she seized control of the

sea at the outset, and so injured the fleet of her enemy that it was unable to disturb her supremacy on the sea, she decided the contest. Practically nothing could save Russia from defeat then, for it was shown by the experience of the Baltic fleet, in the battle of the Sea of Japan, that although by stupendous efforts she might succeed in putting a fleet in the east practically equal numerically to that of her opponents, this fleet would not arrive in condition to defeat the fleet of the sunrise kingdom.

With the sea in the possession of Japan, retreat was the only alternative left to the Russian army. Should the Russian general defeat his opponent and force him to retreat to the sea coast, he could not place the Japanese army in a state of siege, since the latter would have uninterrupted communication with his base. The Japanese could, furthermore, very probably concentrate enough troops at that point to raise the siege. On the other hand the Russians would be adding more miles to the enormous distance they had to bring reinforcements and supplies. This is not the most serious part of it, for the roads along which these supplies would have to be brought were open to attack by sea. If Japan was supreme on this element, how was the Russian army to maintain its line of communications. Clearly, therefore, it was impossible for the Russian army to advance; their only hope lay in retreating, for by this they drew their wily opponents further and further from their base. General Kuropatkin's plan was to yield only as much ground to the Japanese as he had to until the Russian navy could get control of the sea. Then he could advance. But the navy failed to do its part, and on that alone the outcome of the war depended. Russia lost several battles, both on land and sea, but she was really defeated when on February 8 and 9, 1904, Japan destroyed half a dozen of her best ships in the east. Japan accomplished some remarkable victories, both in Manchuria and the Asiatic waters, but she won the victory when she broke Russia's sea power in the east and made possible a war in China. Since, therefore, Japan would have been unable to prosecute a war in Manchuria without the control of the sea, and since this control of the sea was the direct cause of her victories on land, we must add this contest to the long list of wars in which Mahan has shown that supremacy on the sea means ultimate victory.

* Captain Togo: Naval Battles of the Russo-Japanese War, p. 46.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE MEAN POINT OF IMPACT.

By Rear-Admiral Bradley A. Fiske, U. S. Navy.

If a salvo were fired from a battleship in a modern navy at a target 10,000 yards distant, the mean vertical deviation of a 12-inch long-pointed projectile of say 2400 f. s. would be between 20 and 30 feet, and the mean deviation in range between forty-seven (47) and seventy (70) yards, depending on the degree of excellence of her gun pointers.

Assuming the three cases of a mean vertical deviation of 20 feet, 25 feet and 30 feet, respectively, and a target 30 feet high, the probability of hitting is shown in the following table. Four cases are considered: one case assumes the mean point of impact to be on the center of the target, another case assumes the mean point of impact to be 50 yards short or over; another case assumes it to be 100 yards short or over, and the other assumes it to be 150 yards short or over.

Mean vertical deviation.	Mean point on center of target.	Mean point 50 yards short or over.	Mean point 100 yards short or over.	Mean point 150 yards short or over.
20 feet	Prob. 45 %	Prob. 33 %	Prob. 12½%	Prob. 2½ %
25 feet	Prob. 36.8%	Prob. 29.8%	Prob. 16 %	Prob. 5.7 %
30 feet	Prob. 31 %	Prob. 27 %	Prob. 17 %	Prob. 8.2 %

To get a clear idea of the meaning of this table let us imagine two hostile fleets meeting in battle, fleets otherwise equal and having gun pointers of equal skill, but one fleet, A, having a means of getting the sight bar range at 10,000 yards with an average error of only 50 yards (no matter what the means might be), while the other fleet, B, had a means whereby the error was 100 yards. In this case, if the gun pointers were well trained and the weather good, the mean vertical deviation would be only about 20 feet, and A would hit B two and a half times as often as B would hit A. Or

if A had a means by which its sight bar range was 100 yards wrong, while B's was 150 yards wrong, A would hit B five times as often as B would hit A. Or if A had a system whereby he got the sight bar range with an error of 50 yards, while B's error was 150 yards, A would hit B 12½ times as often as B would hit A.

Inasmuch as to find the range at 10,000 yards with an error of only 150 yards is a distinct problem, and inasmuch as the conditions of the atmosphere and the temperature of the magazines cause the range of projectiles to vary considerably at any given elevation, and inasmuch as, *if the mean point of impact be near the center of the target,* it is obviously desirable to have the dispersion as small as possible, it would seem that the problem of hitting a distant target at sea is divided into three very well defined parts: first, to find the sight bar range, in order to ascertain how to put the mean point of impact as close as possible to the center of the target; second, to direct and control the fire, and third, to make the dispersion as small as possible.

The first part naturally divides itself into two parts also: first, to find the correct range; second, to ascertain the corrections due to atmospheric and temperature conditions, so that if this correct range be given to the gun pointers the mean point of impact will be near the center of the target. The second and third parts of the problem are, of course, matters of fire control and training of gun pointers.

In June, 1909, the writer published in the NAVAL INSTITUTE PROCEEDINGS an article called "The Sight Bar Range," which contained the following sentences. The range-finders mentioned were Barr and Stroud range-finders of 54-inches base.

> There are two ways of finding the sight bar range; one is by correcting a previous sight bar range by spotting from aloft, and the other is by measuring the range directly with range-finders.
>
> If either method be used, it is first necessary to calibrate all the guns. If the spotting method be used, all guns of each caliber must be calibrated with a standard gun of that caliber; if the range-finder method be used, each gun must be calibrated with the range-finder that is to get its sight bar range.
>
> On October 9, 1908, the *Tennessee* and the *Washington,* being then 2040 yards apart, steered courses diverging three points, by order of the commander of the second division, for half an hour, and then converged three points, taking simultaneous reciprocal range measurements every five minutes, each having first held up her "corrector" for the range-finder of the other ship. Then each telegraphed her measurements to the other ship.

The wind that day was marked in the log as 3 to 4, and the sea as "moderate." The speed was 11 knots and the wind was on the starboard bow. The conditions for range-finder work at sea seemed average, except the rate of change of range, which was much greater than would probably occur in battle, being 162 yards per minute.

There were 13 observations varying between 2040 yards and 7300 yards. The average disagreement between the range-finders was 33 yards, and the square root of the average of the squares of the ranges was 4874 yards. That is, the disagreement between the two range-finders was 33 yards at 4874 yards.

It is mathematically probable that the true ranges were somewhere between the measurements given by the two range-finders; that is, that the average error of the two range-finders was probably 16½ yards at 4874 yards; which is 25 yards at 6000 yards.

It may be objected that the true range may not have been between the readings of the two range-finders, because both range-finders may have read either over or short. This, of course, is true; but if so, the reason was simply that the marks on the "correctors," which were made on board the *Tennessee*, may not have been placed at exactly the right distance apart; but this would be an error wholly remediable, because the Washington Navy Yard could easily make correct correctors.

However, I had the accuracy of our corrector tested at a known range, when the ship anchored at Panama, by sending our corrector on board the *West Virginia*, correcting both our range-finders by it, and immediately thereafter taking twenty measurements of the distance of the cathedral with each range-finder.

Mr. Russell took these observations, and the mean of twenty observations with the Barr and Stroud range-finder No. 883 was 6949 yards; and with range-finder No. 882 was 6956 yards. The average disagreement of the readings of range-finder No. 883, with its own mean, was 11.8 yards; of range-finder No. 882, was 14.9 yards. The range of the cathedral, as measured from the chart, our position being plotted with the utmost care, was 6925 yards. Mr. Russell took every precaution against self-deception, being honestly anxious to ascertain the truth.

The difference between 6925 yards and 6956 yards is 31 yards; and the error corresponding to 31 yards at 6925 yards is 23½ yards at 6000 yards.

The writer feels justified in concluding therefore that, *with an amount of training no greater than that given a gun-pointer*, the error of the range-finder method, used at sea under average conditions, may be assumed to be about 25 yards at 6000 yards.

This takes no account of the fact that the range-finder is an instrument that can be improved, and that one can practice with it a great deal at sea.

* * * * * * * * *

Thus far, no mention has been made of any factor except accuracy.

Therefore, it may be objected that, even if it be granted that the range-finder method is the more accurate when no guns are firing, yet the range-finder itself is liable to be jarred out of adjustment by the shock of gun-fire.

To this may be replied that—

(a) The turret range-finder mounted on top of the turret of the *Arkansas* now the *Ozark* was not jarred out of adjustment when five 12-inch shots were fired, on April 15, 1907.

(b) The range-finder of the *Tennessee* was not jarred out of adjustment at her battle practice in November, 1908. Of course, the shrouds and stays of the lower mast and topmast were up taut and the pedestal of the range-finder was carefully stayed.

(c) It is easy to make a range-finder so strong, mechanically, that it could not possibly be jarred out of adjustment.

It may also be objected that the vibration of ship during gun-fire is so great that no observer could possibly get range-finder readings.

To this it may be replied that there must be occasional "cease firings," in order to ascertain the range, no matter what method be employed. When using the spotting method it is necessary to wait after each turret shot or salvo until the splash is seen before any correction can be made to the last sight bar range, say 10 seconds; similarly when using the range-finder method a new measurement can be begun in less than five seconds after the discharge, and completed in five seconds more—under average conditions. This ten seconds is not time lost, in either case, because during this time the guns are being loaded.

POSTSCRIPT.

Since this article was mailed to the Naval Institute it has been pointed out that the article may be construed as advocating the abolition of spotting. The article does not advocate the abolition of spotting.

The writer believes in spotting; that is, in having observers above the smoke, who tell, from the fall of the projectiles, whether the range used was too small or too great.

He believes, however, that spotting should be auxiliary to range finding; not that range finding should be auxiliary to spotting.

It seems to him that the principal rôle of spotting is simply that of raising or lowering the mean point of impact, by correcting for some *actual* change of I. V. of the index of powder being used, *if it occurs*; or some change in the "coincidence adjustment" of the range-finder, *if it occurs;* or for both.

So why not use spotting simply to regulate the coincidence adjustment of the range-finder (or range-finders) and raise or lower the mean point of impact in this way? This can be done by a simple mechanical device.

The danger of depending upon spotting alone may be seen when we recognize the fact that, if the enemy has good range-finders, and if the enemy's admiral, after the fleets are drawn up in parallel columns, will carry out the well-known "follow my leader" tactics, changing the course of the leader back and forth, say one point each side of the middle course, he will change the range irregularly and frequently, back and forth, about 93 yards a minute; the fleet speed being here supposed to be 15 knots.

The gradual changes of course and distance will not bother the enemy's range-finders, so they can keep our range all the time; but on our lofty and

exposed fire-control platforms, our armies of spotters, change-of-range-projector-men, and telephonists will not be able to find and transmit correctly the sight bar range.

Since this article appeared the writer has heard many arguments among officers on the subject of getting the mean point of impact on the target; the minority contending that the range-finder offers such a promising means that we should do our utmost to get good range-finders, to mount them on pedestals as short as possible, on as firm foundations as possible, with covers to protect them from the wind, and that we should train a body of range-finder observers at least as carefully as we train gun captains; the majority standing firm on the platform that it is useless to work along this line, because "practical tests in the fleet" have conclusively proved that the range-finder is inaccurate and unreliable.

Other navies, especially the British and the German, have a greater respect for the range-finder than we have. This was to be expected of the British, because the Barr and Stroud range-finder is a British product, and the British Navy made exhaustive tests of that instrument many years ago. But the Germans seem to have stolen a march on everybody and to have solved scientifically and practically the whole problem of placing the mean point of impact on the target. If our information is correct they *have already devised and adopted* a method of applying the necessary temperature and weather conditions to the range tables, and *have already actually built range-finders of long base into their turrets,* where they are protected not only from gun fire, but from the wind, and where they can be given a mounting very firm vertically, but leaving the instrument free from bending forces horizontally, thus almost eliminating the effects of the vibration of the ship and the shock of gun fire.

If our information is correct (and it probably is) the Germans have employed their marvelous ability in applying the principles of science to practical affairs (which is the most potent single cause of their pre-eminence in all departments of endeavor, which ability is developed in their leaders to the point of genius)—they have employed this ability to increase the fighting power of their fleet by a means as efficacious as the increase in the number of the ships.

Our attitude towards the range-finder is freely disclosed in the *Navy Register,* which is not a confidential publication, but is sent

everywhere. The *Navy Register* shows by the ratings given to men, and the extra pay allowed for various services, the values which we attach to various positions and duties. There is not one word said about range-finder observers, and yet practically every other specialty in a ship is recognized. Besides the various ratings themselves we have over a dozen positions in which special remuneration is awarded; which practically states to every navy the fact that we attach no importance whatever to range finding.

Yet there is no work in a ship which requires greater skill than that of range finding; in fact, it may be truthfully asserted that more special and personal skill is required to do range finding *under difficult conditions* than to do any other work on board ship.

Not only is this work difficult, but it is exceedingly important. It is to be exercised in the most critical time that a naval officer can imagine—the opening of a battle—in those few pregnant moments that decide which fleet is to secure the initial advantage—almost the same thing as victory.

Yet our *Navy Register* shows that we attach less importance to the man who is to get us the opening range in battle than to a coxswain of a steam launch, captain of the hold, jack-o'-the-dust or tailor's helper.

One result of our attitude is the well-known fact that we have not a single trained range-finder observer in the navy. Another result is that we thoughtlessly mount our range-finders on flimsy supports, where they vibrate tremendously, and are literally "shaken with the wind."

Another result is that we have allowed another navy to get ahead of us in a matter which involves victory or defeat in battle, and in which we took the lead five years ago.

A peculiar phase of the situation is the small amount of training needed in order to get fairly good results. During the past year the writer has caused the Barr and Stroud range-finders of the Fifth and Third Divisions to be used whenever occasion offered; and in all cases the instrument has seemed to respond gratefully to good care and skilful handling.

On June 30, 1912, while at anchor at Key West, I directed Lieutenant (j. g.) Frank Russell and Ensign Leslie L. Jordan, who had had a fair amount of experience with the range-finder, to take a series of ten readings each of the distance of the Sand

Key Light House. The range-finder (15-foot base) had not been corrected for two or three weeks, and we did not know the exact distance of the light house, but these readings would show how closely the range-finder would repeat. The mean of Mr. Jordan's readings was 10,746 yards, and the mean of the variations of his readings from 10,746 yards was 39.7 yards. The mean of Mr. Russell's readings was 10,743 yards, and the mean of his variations was 29.1 yards. In all cases Mr. Russell and Mr. Jordan made the optical contact without knowing the reading of the scale, and *then* read the scale.

Mr. Russell then took ten readings of an uncharted smoke-stack. The mean of his readings was 12,020 yards, and the mean variation of his readings from 12,020 yards was 30 yards.

As this was extremely good, I determined to ascertain the degree of accuracy of the range-finder at the first opportunity.

On July 3 I had the position of the *Georgia* very carefully plotted. The distance of the lighthouse from the position of the range-finder was measured on the chart as carefully as possible and found to be 11,050 yards.

I then directed the *New Jersey* to hold up her corrector board to the *Georgia,* and directed the *Georgia* to adjust the 15-foot range-finder on the forward turret by the *New Jersey's* board. This was done, but as soon as it was done the ship swung so that the range-finder would not bear on the lighthouse.

The next forenoon, however, the ship swung back to her former position, and Mr. Russell took the following ten readings:

No.	Readings.	Variation from Mean.	Variation from Range by Chart.
1	11,025	5	25
2	10,975	45	75
3	11,000	30	50
4	11,050	20	0
5	11,050	20	0
6	11,025	5	25
7	11,050	20	0
8	11,025	5	25
9	11,075	45	25
10	11,025	5	25
10	110,300	200	250
Mean	11,030	20	25

Half an hour later Mr. Jordan took the following ten readings:

No.	Readings.	Variation from Mean.	Variation from Range by Chart.
1	11,075	17	25
2	11,100	42	50
3	11,025	33	25
4	11,050	8	0
5	11,105	47	55
6	11,050	8	0
7	10,995	63	55
8	11,100	42	50
9	11,005	53	45
10	11,075	17	25
10	110,580	330	330
Mean	11,058	33	33

The conditions under which these observations were made were better than the average; the atmosphere was fairly clear, there was not enough wind to shake the instrument, and the ship was steady. Yet, it must be distinctly comprehended, these conditions did not increase the accuracy of the range-finder; they merely permitted accuracy to be obtained without requiring a very high degree of skill from the observer.

The tests made in the *Georgia* supply a curious and gratifying verification of the results obtained in the *Tennessee*. To say that the results obtained in the *Tennessee* as published in the INSTITUTE PROCEEDINGS were received with incredulity would be to put the matter mildly; but nevertheless they were correct. In the article published in the INSTITUTE PROCEEDINGS the conclusion was, "With an amount of training no greater than that given to a gun pointer the error of the range-finder method used at sea under average conditions may be assumed to be about 25 yards at 6000." Now this was with a 54-inch range-finder. With that range-finder the error at 11,000 yards would have been 25 multiplied by 11^2 divided by 6^2, or 84 yards, supposing the atmosphere to be perfectly clear in both cases. With a similar range-finder having a 15-foot or 180-inch base the error at 11,000 yards would have been 84 multiplied by 54 divided by 180, or 25.2 yards.

If it be granted that these tests prove that the range-finder itself is accurate, and that, if properly handled under favorable conditions, excellent results will be obtained, it remains simply to

recognize the fact that unfavorable conditions, such as vibration, wind and relative movement between target and range-finder, do not, and cannot, alter the accuracy of the range-finder as an instrument. They merely make it necessary for the observer to be skilful.

This seems to mean that we ought to mount range-finders properly, and to train observers, so that under difficult circumstances we shall be able to take advantage of all the accuracy of which the instrument is capable, shorten the time of getting the mean point of impact on the target, and keep it as close to the center of the target as possible.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

NOTES ON THE APPLICATORY SYSTEM OF SOLVING WAR PROBLEMS, WITH EXAMPLES SHOWING THE ADAPTATION OF THE SYSTEM TO NAVAL PROBLEMS.

By MEMBERS OF THE STAFF, U. S. NAVAL WAR COLLEGE.

THE ESTIMATE OF THE SITUATION.

This is the foundation upon which is based the deductive or applicatory system of studying and solving war problems.

This system is the ground work upon which the Germans have been building for so many years, and to which all military writers ascribe her wonderful development in leadership and in knowledge of the art of war.

It stands alone, without a rival, and has so stood for a hundred years. It has been consecrated by success in its application to conditions of war, and it behooves any who would seek to gain efficiency in the art to follow in the wake of its most successful teachers.

We have not been diligent, heretofore, in getting at this root of success; to see in what kind of substance it germinated and from which it extracted vigorous life.

We should not at this late day disdain to begin our professional life anew so far as it is concerned with the study of the art of war, and begin at the A B C, which we have too long neglected in our desire to practice without its knowledge.

We are in exactly the same position as the youth at school who chafes at his books and longs to get out into the practices of life. He disdains the course that the experience of ages has shown to be the best and surest road to success. He goes forth into life a mediocre man; or, if he achieve success, it is because of other attributes the development of which by proper training would have assured to him a higher success.

It is equally true that no amount of education or training would assure success to some, but no one can deny that careful and assiduous training is vastly beneficial even to the stupid.

So with this system of training in war—it is not designed to create genius. That springs from a seed of its own, the germ of which has never yet been discovered. Its whole aim is to provide a higher education, a better training for the mass. It will not stultify genius, and it will raise the standard of average ability.

This system of training had its origin in the Prussian general staff many years ago. It was not, however, until after the successes of Prussia in her war with Austria, in 1866, and the successes of United Germany at war with France, in 1870, that other nations were led to inquire seriously into her system of training.

Not until then was its principle grasped and its efficacy appreciated. But unfortunately we were not among those who felt the necessity of thus reasoning from effect to cause.

We, as a nation, are reluctant to shape our course in accordance with foreign standards.

We are surfeited as a people with an overweening self-sufficiency that is a natural outgrowth of our origin and development as a nation and our position in the world.

As military men we have inherited this trait and have therefore been slow to recognize the virtues in any system of training that has not been evolved by us.

It may be pardonable for the masses to feel that the military inheritance left us by those who fought in our past wars discounts any system of training evolved or discovered abroad.

But it is not pardonable for military men, whose profession is the conduct of war, to fail to search out the truth; and, having found it, by whomsoever discovered, to fail to follow it.

It has only been a few years since the voice of command was heard in our army, and that voice demanded criticism of our past military history and not blind worship of ultimate results. It demanded that, at least among military men, war be studied according to a system, and as there was but one system they embraced that one.

Now, war is war; and whether we choose to study it as army or navy men, it is still the same subject, only handled with different tools.

We cannot learn how properly to use those tools until we know something of the art that we are going to practice with them. Knowing the art is common ground for us all, knowing our tools is our especial science; but each with his own tools may become better able to apply them to the task co-operatively if each is well grounded in his knowledge of the art.

Strangely enough, we of the navy, with all our spirit of alertness and progressiveness in perfecting the details of our instruments, have not yet awakened to the fact that there is an art in the employment of those instruments in combination as well as a science in their use as individual units.

Or, if we have appreciated the existence of the art, we have failed to realize the virtues of the only known, well designed system of training that alone can lead us to a higher development of our profession and make us fit for the conduct of war.

That we may not longer continue in ignorance of our basic necessities, the endeavor of this paper will be to lay bare once more the principle; and to urge the importance of grounding our study of war upon a system that has been and is a torch of progress in the art, and which we have hitherto failed to see; or, seeing, have not firmly grasped.

The events that led up to the formulation and adoption of this system of training are interesting historically and illuminating.

We all know how the armies, led by the genius of Frederick the Great, established the integrity of Prussia and became the model in discipline, organization and training for all the continental powers.

We know, too, how intolerant of criticism or of suggested change in method were the leaders who came after Frederick the Great.

How could any system of training for the conduct of war in the Napoleonic era be better, they maintained, than the brilliant heritage left to them in Prussia less than 50 years before by the great king?

Steeped in their self-sufficiency, disdaining to learn from events that forecasted a radical change of system, they had their awakening at Auerstadt and at Jena in 1806.

The disasters that there befel the Prussians were not incident to any decay in their race, their spirit, or their fortitude; nor to a neglect in their training according to the system that had been handed down to them.

They were still soldiers in every sense of the word; and they were pitted against soldiers, in 1806, no more valiant than those over whom their fathers had won so many victories under the great Frederick.

The causes were elsewhere to be sought; and out of the overwhelming disasters of Auerstadt and Jena, and the utter humiliation forced upon Prussia by the treaty of Tilsit, in 1807, there sprang a spirit of determination to search out and expose the truth.

The truth that seemed to stand out as particularly condemnatory of their highly prized organization and system of training was, that it needed the genius of a Frederick the Great to make it effective in war.

They realized that they did not have a Frederick the Great; that they were living upon a tradition; and that, therefore, when the first clash came, with the great genius of modern war, their organization and system went down to utter defeat and ruin.

They may have realized, too, that Napoleon's system of training possessed the same inherent weakness that underlay their own; for Napoleon's system, deprived of the genius of his own leadership, met defeat more often than it did victory.

It is a significant historical fact that Napoleon's marshals, with probably but one exception, Davout, after many years of active campaigning under his direction and guidance seemed, when acting independently, unable to apply successfully, against the forces opposed to them, the principles of grand tactics that made their master the greatest soldier of modern times.

The general principle underlying the deductions made from their experience by the Germans, relative to a system of training, seems to have been that it is *safer and wiser to develop by training a high average of ability* in leadership than to trust to untrained "common sense" or to the development of a genius in time of war to lead mediocrity to success.

In this crisis the Prussians were fortunate in recognizing the wisodm of Scharnhorst, who pointed out to them the way that ultimately led to victories of even greater import to Prussia as a nation than her former defeats had been.

Under his guidance was instituted a real staff college, whose function was to take up the studies of campaigns and to formulate, solve and discuss concrete war problems.

These problems seemed at first to be based only on the studies of past campaigns, but later they were cast also in the mold of possible future campaigns.

Under the direction, first of Scharnhorst, then of his pupil Muffling, and, for 31 years prior to his retirement, in 1888, of von Moltke, this system of training was developed. In 1870 its fruition was seen in the unbroken succession of victories over the French, whose generals, be it remembered, had had far more experience in the field in active operations than the German generals had had up to that time.

Thus was inaugurated and systematized what may be termed a new art—the art of waging war in time of peace.

The basis of this system of training is founded upon a method of teaching how to approach the solution of war problems. It is, therefore, in its beginning a training in mental processes. Later the conclusions derived from the mental processes are translated into action.

This system of training embraces three phases.

The first phase is embodied in the estimate of the situation—a mental process which leads up to and expresses the decision, or what, under the circumstances, you have made up your mind to do.

The second phase teaches us how properly to translate the decision into an order. Having made up your mind to do something, how are you going to do it?

The third phase translates the mental processes into action and has to do with carrying out on the field or in the game the tactical or strategical dispositions made in the order.

At first it may seem to savor of a return to class-room days to have to make what appears to be a labored preliminary to a decision on a war problem, but we must bear in mind that we are dealing in war with an art in the practice of which we are mere tyros, and for the study of which we have, heretofore, employed no tangible system of training or practice, and it behooves us to make our profession our business.

Short cuts to fame in the art of war are reserved only for the genius.

Were there other equally good and more direct methods of learning how properly to solve a war problem, or how to obtain in a concrete way a training in time of peace for the conduct of

war, it is safe to say that it would have been discovered at some time during the hundred years that have passed since the inception of this system.

When this system of training is thoroughly understood and sedulously practised it ensures the development of military character. It trains the individual in military judgment, in decision, in command and leadership.

It assures thoroughness and similarity of treatment of any war problems. This feature of its method, combined with a good knowledge of military history, leads, under good direction, to a proper application of military principles and to an approximate agreement in judgment or decision. If it does not accomplish this end entirely, it, at least, tends to eliminate that which is inherently and essentially erroneous.

All this ensures to a superior the guarantee of a trained judgment in his subordinate, and inspires that confidence that leaves untrammelled and stimulates the exercise of initiative on the part of a subordinate.

The first phase of this system of training is embodied, as was stated before, in the estimate of the situation.

This is a term used in a military sense to express that logical process of thought, which, applied to a concrete strategical or tactical problem, enables one to arrive at a definite strategical or tactical decision.

It involves a careful consideration, from the commander's viewpoint, of all the circumstances affecting the particular problems.

It embraces a full consideration of any strategical or tactical situation under four subheads, namely:

1. The mission.

2. Enemy forces: Their strength, disposition and probable intentions.

3. Our own forces: Their strength, disposition and courses of action open to us.

4. The decision.

The mission is a clear and concise statement of the orders or instructions under which the commander is acting or a statement of what he deduces from his knowledge of the situation.

It is an answer to the question: What is the task set before me?

Quoting from Captain Roger S. Fitch's pamphlet on the sub-

ject of Estimating Situations, we find the requirements of the mission clearly set forth and expressed as follows:

When a command is acting merely as an integral part of a larger command its mission is ordinarily determined for it by higher authority. In the case, however, of a practically independent command, or in any case where a force is acting under instructions of a discretionary nature, the commander will ordinarily have to deduce his mission from his knowledge of the general situation, his acquaintance with the intentions or desires of the superior who sent him forth, and his appreciation of the existing military situation.

Although each situation influences the mission and conduct of an independent leader in quite a different manner than it would if his command were directly dependent upon another, and he himself merely obeying precise and definite orders susceptible of but one interpretation, yet in the one case no less than in the other, the general purpose of the supreme commander must always be borne in mind. The means, however, by which the general purpose may best be furthered will differ greatly. As General von Verdy says: "The officer who suddenly encounters the enemy while patroling with his platoon must conduct his actions from a different point of view than if he commanded his platoon as skirmishers in front of his company. A division in an army corps will generally be so situated that it must carry out an action even though it be completely annihilated in so doing, and then it would still be promoting the general purpose; on the other hand, a division widely separated from an army would, as a rule, utterly fail to accomplish its mission if it allowed itself to be annihilated."

Under the second sub-head—Enemy forces—we should deduce from the best reliable information at hand, what his strength is, how disposed, and what his probable intentions are.

It seems manifest here that, if the judgment of one who is estimating the situation for himself is trained and practiced, he will, by putting himself in the place of the enemy commander, conceive with good judgment what that commander would or should do. His decision would, therefore, be based on better knowledge of the enemy's probable intentions than if he merely made a rough guess of the basis of outward indications of the enemy dispositions.

Under the third sub-head—Our Own Forces—a statement of the strength of our own forces and all the circumstances that may have a bearing upon the relative strength and mobility of the two opposing forces is comprehended.

Then follows a review of the various courses of action open to our forces that might lead up to the accomplishment of the mission.

These courses of action should be clearly outlined and definitely considered.

When we have gotten so far in our estimate we should be prepared to weigh carefully the various methods that suggest themselves as possibly satisfying the demands of the mission; and, by a process of elimination we arrive at the fourth subhead of the estimate—The Decision.

I cannot do better than quote here from Captain Fitch's digest on the Decision.

> Having carefully weighed the advantages and disadvantages of the various methods open to him, the commander should *definitely decide upon the one plan of action which promises the best opportunity of enabling him to accomplish his true mission.* A commander's decision upon a single definite plan of action is therefore the culmination of his estimate. It is the cap-stone of the structure which he has built upon and around his mission.
>
> Buddecke, after stating that the marks of sound tactical procedure are "simplicity and a firm adherence" to the line of action adopted, says: "The decision, once reached, must be unwaveringly carried out with our whole energy. This condition is of so great importance in tactical affairs that the best course of action, if carried out half-heartedly, will come to naught, while a mistake in the choice of courses can often be entirely offset by decided and confident action."
>
> As Griepenkerl says, *"Arrive at a definite decision. . . . .* I warn you against half measures. For example, if you have decided to attack, do so with all your troops! if you wish to retreat, do not come to a halt again after a few miles without the weightiest reasons. *Be perfectly clear in your own mind what you want to do and* then carry it out to the letter."

The ideal employment of the system would be a combination of its three phases in any one situation; that is, assuming any war problem, make first an estimate of the situation on each side which leads to a decision; then write the orders to carry the decision into execution; then carry on the action on the game board to test the decision and order.

That would consume more time than can be allotted in the short session of a summer conference, and we would hardly be prepared to go so far until we have had necessary practice in the elements of the general scheme.

We shall have accomplished a satisfactory result and all that could be expected in the time if we become thoroughly acquainted with those elements.

In considering the problems it is well to have in mind certain pertinent facts.

The main one is, to confine yourself to the problem in hand. Solve that problem and not one that you may think is more probable or better.

There were cases last year (1911) when members did not like the conditions laid down in the problems, and their solutions were influenced by considerations not comprehended in the situation placed before them.

That this is not an unusual or altogether unreasonable attitude can be seen by historical reference that is at once interesting and illuminating.

In von Moltke's verbal criticism of the solution of his 53d problem, presented to the German Staff College, in 1876, there is found the following comment:

Some other gentlemen have made the situation still more difficult for themselves than that which the problem presented, and have assumed that the enemy is standing already at Dasdorf, and had already occupied the defiles of the Wandlitzer See, and at Stolzenhagen. There are some even who imagine the enemy to be already at Zerpenschleuse. They said to themselves: "Since the enemy comes from Berlin, he can just as well march those 16 miles to Basdorf." Well, it is possible, but the problem says nothing about it. The enemy can certainly march with the cavalry and artillery, and let the infantry go by rail to Bernau, in order to keep it as fresh as possible.

I admit that the whole siuation, so briefly stated, is somewhat improbable. A Prussian division is marching from Frankfort to Zehdenick, while the enemy is at Berlin. But to state everything in the problem, the whole history of a campaign would have to be given as an introduction. Not till then could one say: "That is possible and that is impossible."

I have taken the 5th division because its composition is very simple and known to all. I could just as well have taken a Swedish or Russian division, but then we had to work with troops unknown to us. Gentlemen, you had therefore to accept the situation simply as the problem stated it, and not to look for anything special beyond what is given, otherwise there is no limit to speculation. The enemy need not at all come from Berlin; he can also come from a greater distance. You, therefore, must not look behind the situation for a special trick, and think we wish to lay a trap for you.

Also in his criticism of the solution of his 59th problem we find as follows:

You will get one more problem which is simpler, and you will work it out simply also, and not bring in things which lie outside of it. If gentlemen have puzzled their heads as to whether the 12th and 13th Army Corps are following behind the 11th Army Corps, if they ask: What will

happen if the enemy makes a left turn at Kerstenhausen in order to unite with the Western Corps somewhere in Westphalia, or if he advances on Cassel on the right bank of the Fulda? Well, gentlemen, these are quite new problems, and all the military, strategical, and political circumstances would have to be presented to you. You must confine yourselves to what is given.

In conclusion, I wish further to remark that a logical development of the idea, a correct and clear manner of writing, and a good style are also factors which have something to say when the problem is criticised, even if it is not solved exactly in the sense which presents itself to me as correct.

It is not within any one's province to say with authority that any one solution is the correct one. The effort is to reach a good, logical and acceptable solution. No more is demanded and no more can be expected.

It is significant in this regard to quote again from von Moltke's remarks in connection with his 53d problem:

This, gentlemen, is only an example; in it I have given you only my opinions; this does not preclude others from being equally correct.

Again in his criticism of the solutions of his 63d problem he says:

Other gentlemen have arrived at different results. That cannot be wondered at; different opinions may exist, if they are only brought out in a logical and clear manner.

Again in his treatment of the discussion on his 65th problem he says:

There are several papers which have not adopted exactly the same measures which I propose, but which are clearly and logically written, and from which a correct military judgment may be inferred. That is the main point, for in war as well as in art there is no fixed rule; talent cannot in either be replaced by a regulation.

In respect to the method of handling the discussion, if members of the conference should feel that the discussion is too much abridged and that it does not lead to a final consensus of opinion on the solutions presented, it is submitted that our allowance of time does not permit of protracted discussion, and that a consensus of opinion, even if desirable, would be difficult to obtain.

In this connection it is interesting to quote from von Moltke and get his idea on the method of closing a discussion on a problem:

Well, gentlemen, I must unfortunately break off these exercises. I think if we had still more time and could discuss some of the answers, we would very easily come to an understanding.

In closing I wish to state that various authorities support the views herein expressed. The views of this eminent authority, von Moltke, on strategy as given in one of his discussions, and his conclusions as to the only methods of furthering education in the art of war, are here quoted:

That is nearly all that I have to say in reference to these papers. If one wishes to answer such questions as are set here, one likes to look for certain rules and axioms. Such can, however, be only offered by science, and that in our case, is strategy. But strategy is not of a kind like the abstract sciences. These have their invariable and precise truths upon which we can build, and from which we can draw further conclusions. The square on the hypothenuse is always equal to the sum of the squares described on the sides which contain the right angle; that remains always true, be the right-angled triangle large or small, be its vertex turned to the east or the west. . . . .

Strategy is the application of common sense to the conduct of war. The difficulty lies in its execution, for we are dependent on an infinite number of factors, like wind and weather, fogs, wrong reports, etc. If, therefore, theoretical science alone will never lead us to victory we must nevertheless not entirely disregard it. General V. Willisen very truly says: "It is only a step from knowing to doing, but it is a still greater from not knowing to doing." The best lessons for the future we draw from our own experience; but as that must always be limited we must make use of the experience of others by studying military history. Besides which, another means of furthering our education is the working out of such supposed warlike situations as our problems present.

PROBLEM.*

Situation.—War was declared between Red and Blue 18 January, 1909. The Blue main fleet left Guantanamo on that date for

*In problem work, types of vessels are indicated as follows:

AA All big gun battleships.
A Battleships, 1st class.
N Battleships, 2d class.
BB Battle cruisers.
B Armored cruisers.
M Monitors and C. D. vessels.
C Cruisers, 1st class.
F Cruisers, 2d class.
D Gunboats.
S Naval scouts.
E Merchant scouts.
V Destroyers.
t Torpedo boats.
g Torpedo gunboats and despatch vessels.
sm Submarines.

the Pacific via Magellan Strait. The Pacific detachment under command of Rear-Admiral J— is at Seattle. This detachment consists of 6 B, 4 C, 5 V and 3 colliers.

On 10 February, 1909, at 9 a. m., Rear-Admiral J— receives information that a large Red convoy of transports with escort was sighted at 6 a. m., 8 February, in Lat. 51° 30′ N., Long. 160° W., steaming eastward, speed about ten knots.

The Pacific detachment is organized as follows:

Division Ten.
REAR-ADMIRAL J——
B-1, B-2, B-3.

Division Eleven.
REAR-ADMIRAL H——
B-4, B-5, B-6.

Division Thirteen.
CAPTAIN W——
C-1, C-2, C-3, C-4.

Destroyer Division Seven.
COMMANDER F——
V-1, V-2, V-3, V-4, V-5.

REAR-ADMIRAL J—— commands.

Required.—Rear-Admiral J—'s estimate of the situation.

ESTIMATE OF THE SITUATION.

Mission:—To prevent this enemy force from landing on our coast.

Enemy Forces.—Their strength, disposition and probable intentions.

Information regarding the strength and disposition of the enemy forces is very indefinite. All that is known is that there is a large convoy of transports with an escort steaming towards our west coast. The escort would likely be a formidable one, for such a movement on the part of the enemy would indicate that he was directing his maximum effort towards invasion, and the protection necessary for the transport of a large body of troops would entail the employment of a naval force very considerably superior to any force that we might at present be able to send against it.

The necessity of guarding the convoy, however, entails a tactical weakness which might be taken advantage of.

Judging from the position in which this force was sighted and its course, it seems most probable that it is proceeding on a great circle course from the enemy home country to the Puget Sound region. The enemy, therefore, probably intends to occupy that region as the first step in his invasion.

This force will probably be proceeding with a strong screen well advanced from his train and from the main body of the escort. At night he will probably adopt a close screening formation around his train.

Our Own Forces.—Their strength, disposition and the courses of action open to us.

Our own forces consists of 6 B, 4 C, 5 V and 3 colliers. This force, though small, represents all that we have in this theater of war.

There is nothing else with which to oppose the evident purpose of the enemy, and the situation demands immediate and well directed activities.

The courses of action open to us are:

1. To remain within the waters of the Puget Sound region; to deliver an attack upon the convoy in those waters in case that be the enemy objective.

2. To proceed to gain contact with the enemy forces to determine their strength and dispositions with a view to attacking the convoy before it arrives on our coast.

Inasmuch as the strength of the enemy escort is not known, and since it may be much stronger than the forces in this command, it would be extremely hazardous to await his entrance into the Straits of San Juan de Fuca before preparing an attack.

The enemy will realize that he will be opposed by whatever force we may have, and if he reach the straits unmolested he will be in a position to guard the entrance, after his convoy shall have passed, against any force that may try to enter, and he will be able to push ahead a strong reconnoitering force to uncover the position of any naval force of ours that may be inside the straits or the sound. He would then be able either to defeat or contain that force and it could no longer menace his convoy.

Our naval force inside the straits could for a time be under the protection of the series of Puget Sound fortifications, but they could be contained behind those fortifications, and the work of landing the enemy troops could be carried on with security.

Employed in this way our naval force would come in the category of what Admiral Mahan has called a "fortress fleet," and which he designates as a faulty and vicious employment of an active naval force.

The fortifications would most likely fall because they could be taken in reverse; and when that time comes, this force, employed behind those defenses, will be lost without accomplishing its mission or seriously menacing the progress of the enemy's campaign.

The first course mentioned must, therefore, be rejected. The second course mentioned conserves the mobility of this force, and tends to clear up the situation by providing us with information relative to the strength and disposition of the enemy's escort, which is an absolute necessity in order that proper dispositions can be made with a view to harassing and attacking the convoy.

Bad weather conditions, likely to be met with at this season of the year in the northern Pacific Ocean, may cause a considerable elongation of the enemy's formation beyond his power to successfully protect; it may even cause a scattering of his force. These conditions should be favorable to our purpose and they are possible advantages that we should be in a position to grasp.

Decision.—To proceed to sea with my entire force with a view to attacking the enemy convoy.

This completes Rear-Admiral J—'s estimate of the situation.

Having arrived at the above decision, based upon the reasoning which precedes it, Rear-Admiral J— then concerns himself with the tactics of the dispositions he intends to make of his forces and arrives at the following tactical decisions as a basis of his orders:

TACTICAL DECISIONS.

1. To proceed at noon.

2. To follow great circle course from Tatoosh towards point where enemy was sighted.

3. To form a scouting line of 40 to 50 miles in advance of main body with 25 miles between vessels.

4. To keep armored cruisers and destroyers together.

5. To send colliers to rendezvous 60 miles S. W. of Cape Disappointment.

6. To appoint a rendezvous for combatant vessels 20 miles West (mag.) of Tatoosh Id.

7. To use cipher B for wireless.

8. To remain in B-1 with main body.

CAMPAIGN ORDERS.

Both before and during the progress of military and naval operations, the general plan and strategic objective will probably be laid down in letters of instruction issued by the commander-in-chief or other superior authority.

Routine orders will govern administrative features, and include general orders, special orders and circulars.

In naval operations tactical movements will generally be directed by signal.

Campaign orders will apply to situations comprising both strategical and tactical features, and in character and scope are intermediary between the letters of instruction and tactical signals. Ordinarily campaign orders will not include administrative details, which are better left to general and special orders.

The commander first makes an estimate of the situation, and on that bases his decision upon a definite plan of action. He then proceeds to draft the orders carrying the decision into effect. These orders then are the means employed by the commander to acquaint his subordinates with the disposition of the enemy's forces, and of his own supporting forces, his decision, and the character of co-operation expected of the various units of his command.

The form for naval compaign orders is virtually the same as that adopted by the army for field orders, this in turn being based on the German "Operation Order." Some alterations in the army form have already been made to adapt it to naval conditions, and organization, and it is possible that other changes may become necessary after sufficient experience in use of the form.

For army purposes, field orders are issued orally, by dictation, or, in writing, though *written* orders are the rule. For naval purposes, campaign orders will be written and addressed to the subordinates charged with the execution. On occasions they must be sent by wireless, their adaptation to this method of transmission constituting a question to be discussed, when the form of the order itself comes up for discussion.

As the form in use at the Naval War College is based ultimately on the German model, reference is made here to the various German authorities and to the Field Service Regulations of our Army.

In formulating a solution to a military order problem, Griepenkerl lays down the following requirements:

1. Read the problem carefully several times, map (chart) in hand.

2. Study carefully on the map (chart) the ground (region) under consideration.

3. Realize accurately your own situation and that of the enemy.

4. Read the appropriate sections in the Tactical Guide (Tactical Signal Book). On principle, verify everything about which you may be anywise in doubt.

5. In the movement of troops (forces) calculate by measurement of distances, the time necessary.

6. Consider the counter measures likely to be adopted by the enemy.

7. Arrive at a definite decision.

8. Consider the distribution of your troops (forces). All the forces concerned in the operation must be included in the order.

9. Formulate the order.

To comply with these requirements in a naval campaign order involves a careful study of the chart of the area under consideration. It will occasionally be found that unless this be done the contemplated movements cannot be executed. It may be possible that a reference to the sailing directions of the vicinity may be necessary.

The Tactical Signal Book prescribes the methods by which certain movements will be executed and is authority on distances, intervals and bearings in formation. By making use of the requirements of the Tactical Signal Book it will often be found that the orders may be shortened and still more often that detailed explanations may be avoided. If it should be necessary to vary from the Tactical Signal Book, it will follow that the contemplated movement must be prescribed in detail.

The commander is supposed to know accurately his own situation. In regard to the situation of the enemy he will be compelled to make allowance for unknown factors. The most usual error is to assume that the enemy is inactive. Really he is likely to do the very thing that may be most embarrassing.

The decision and distribution of forces is given in the problem posed.

FORMULATION OF A CAMPAIGN ORDER.

Every order must be logically arranged. Each order is paragraphed and all pertaining to the same subject must be united in the same paragraph. The most important matter appears first. In establishing a formation, as in a military march order, the forces are noted in the order of formation.

The order must be brief. Brief sentences are most easily understood. Conjectures, expectations, reasons for meausres adopted, detailed instructions for a variety of possible events, have no place in an order. Test the order to see if some superfluous word may not be omitted, or whether some shorter and more suitable expression may not be used. Rewriting an order is good exercise—it is rarely found that an order cannot be improved by consideration and rewriting. The acid test would be to rewrite the order and find it impossible to put it in any other form than that in which it was previously written. The final form should be such that for transmission it *must* be copied verbatim—to omit or to add a word would alter the meaning.

Orders should be clear and definite. Expressions depending on the view-point of the observer as right, left, ahead of, astern of, on this side, beyond, etc., are not admissible and compass bearings should be substituted. The terms *van, rear, right flank,* and *left flank* are applicable to portions of forces in formation but might not be practicable for use after contact with the enemy.

An order must be positive. The commander must accept the entire responsibility—there should be no attempt to divide it with his subordinates. If misunderstandings arise, the chief fault is considered to lie with the officer issuing the order. Such expressions as "attempt to capture," "as far as possible," "as well as you can," should never enter an order, and "according to circumstances" is a term absolutely prohibited. Do not use the terms "expect" or "presume," as the expectations or presumptions may not be verified, confusion ensues and subordinates lose confidence in the judgment of the commander. The more difficult the circumstances the more clear and positive must be the order.

An order must not trespass on the province of the subordinate. This is one of the most difficult requirements to be fulfilled and the most frequent of all errors, both in actual operations, and in the solution of problems. Great commanders have been guilty

of it habitually, and to it some owed their downfall. *The details of execution must be left to the subordinate,* who is probably better qualified to deal with them. It follows, therefore, that an order should not attempt to prescribe the method of operations too far in advance—a time limit is placed on the period which one compaign order is intended to cover. It is an error to extend an operation of an order so far ahead that in the meantime conditions may have entirely changed. Such orders must be recalled and others substituted and this is demoralizing. In practice it is usually possible for the commander to interfere if the attainment of the object in view is considered jeopardized, but there must always be urgent reasons for interfering with a subordinate's freedom of action. This applies more particularly to American psychological characteristics than to those of other nations.

It is possible that on occasions, for special purposes, and for reasons known probably to the commander alone, he may decide to give detailed instructions in regard to some particular matter. For instance, in establishing a scouting line, it will usually only be necessary to prescribe the scouting bearing and interval. The commander of the scouts will most likely conduct the scouting efficiently, at any event it must be assumed that he will do so. Still the commander of the forces may desire to hold the scouts to a certain line or he may wish to gradually advance or retire the scouting line. Or he may desire to make a special investigation of some port or island or vicinity in which case it would be proper for him to prescribe these details for the commander of the scouts. Again the personality of the commander receiving the orders may influence their character. The higher a commander, the shorter and more general may be his orders. In the final essence, however, the continuity of the whole, the unity of leadership, and the leader's own views and intentions outweigh all other considerations.

In every order particulars of time and place must be so carefully stated as to preclude any error.

Orders issued by subordinates should not be mere repetitions of those from higher authority with additions of their own. New orders are generally clearer and more satisfactory.

Arrangements for retreat are communicated confidentially to a few senior commanders only.

ORDER FORM.

Campaign Order No. ——

Name of Detachment or Force.
Name of Ship.
Location of Ship.
Day of Month, Month, Year, Time of Day.

FORCES.

(a) Name of subdivision.
Rank and name of Commander.
Composition of subdivision.

(b) Name of subdivision.
Rank and name of Commander.
Composition of subdivision.

(c) Name of subdivision.
Rank and name of Commander.
Composition of subdivision.

1. Information of the enemy, and information of our own forces, in the theater of operations, but under other command.

2. Plan of the Commander.

3. (a) The (name of sudivision "(a)" underscored) will .....

(b) The (name of subdivision "(b)" underscored) will .....

(c) The (name of subdivision "(c)" underscored) will .....

(x) Contains instructions in which all the subdivisions under paragraph three are equally concerned.

4. Orders or instructions concerning the train.

5. Where messages will reach the Commander of the whole force.

(Sig.) Name of Commander of Force.
Rank,
Commanding (Name of Force).

Copies to
Commanders of forces concerned.
How sent by (wireless, guard boat, aid, delivered in person, etc.).
Attest of delivery (for file copy).
Name, rank.

Alternative Form of Authentication:

By order of (C-in-C.)
Name,
Rank,
(Title of official acting for C-in-C.)

EXPLANATION OF FORM.

The heading follows generally the form prescribed by the Navy Department. "The name of the detachment or forces," and "the name of the ship" should be preceded by the name of the nationality, as "United States Scouting Detachment," "U. S. S. *Mohigan.*" If the ship is a flagship the word "*flagship*" should follow the name of the ship on the same line with it.

On the next line follows the name of the place at which the ship is; if at sea, the location by latitude and longitude.

On the 4th line is the date expressed in the order indicated in the form. The day of the month is given in figures. The month is written out. The year is indicated by the last two figures. The hour is noted to minutes and whether a. m. or p. m.

Example: "9 June 11, 10.15 a. m."

Times of "noon" and "midnight" should be written out.

On the left, one inch from the margin, and on the same line as "Location of ship" is "Campaign Order"; beneath it the number of the order.

The order begins without "Sir" or other form of address.

The first act in writing the order after the heading and numbering of the order is to write *"forces"* in the place indicated in the form. *"Forces"* enumerated in this form are those concerned in the order.

The subdivisions of *"forces"* are lettered. The subdivisions of the *"forces"* are those that the commander in his estimate of the situation decided were necessary and proper.

The forces are subdivided and named according to the functions they are to fulfill, and not according to the administrative or tactical organizations given in the fleet roster. In each case the name of the subdivision is followed on the next line by the rank and name of the commander of that subdivision and on the line following by the composition of the subdivision. This composition is indicated by squadrons or divisions if the subdivision is large, by single vessels, if the subdivision is formed of parts of divisions.

In a military order the subdivisions are arranged in order of importance; for instance, in an order of attack in the order of—artillery, main body, reserves, cavalry, engineers. If it is march order the subdivisions are arranged in the order of march, as—independent cavalry, advance guard, main body, signal troops, etc. In a naval campaign order they will be arranged in the general order of formation. When a subdivision is commanded by the commander of the whole force his name is omitted under the name of the subdivision that he commands in person.

A small interval is left on the right of the space occupied by *"forces"* and one blank line is left beneath this space. The remainder of the order is written on the available space.

Paragraph 1 contains: (1) Information of the enemy; then (2) of our own forces in the theater of operation, but under other command. It is conducive to clearness to separate the information of the enemy and the information of our own forces by paragraphing.

The information regarding the enemy will usually be very nearly a repetition of the conditions stated in the problem, though it is not always necessary to include all the conditions stated as they are primarily for the information of the officer writing the order.

It is preferable that each officer should give his own understanding of the case and not give a statement of the situation word for word. "Even when the commander, lacking satisfactory or exact knowledge, is unable to give definite information of the enemy, a statement of what seems to him most probable, based on the best information he has, deserves a place in the order, but it should be stated as a belief or probability, and not as a positive fact."

In Paragraph 1, and after the information of the enemy, is entered such information of our own forces other than those addressed which it is considered desirable for them to have. This should include information of any force whose action may influence in any way the operations of the forces included in the order.

Geographical names usually are found in this paragraph. Wherever these names are mentioned they must be printed unless they are clearly and legibly written. Such names should be written all capitals in typewriting. As an instance, in one of the problems last year BASHEE was not written in capitals and it became BASHU.

In a military order where geographical names enter to a great extent, it is a custom, where names are pronounced differently from the way they are spelled, to enter the phonetic pronunciation also.

Paragraph 2 contains a comprehensive statement of the general plan, sufficient to insure intelligent co-operation between the units of the command. "It is unwise to include too many details of the plan in orders, but it is essential to disclose sufficient to enable subordinates to conduct themselves intelligently." "It is always of importance that subordinates should understand the *object* of what is ordered, so they may strive to attain it them-

selves even should changes in the general situation demand on their part *different* action from that originally contemplated."

In paragraph 3 the duties of each group or subdivision of the forces are expressed in general terms, the details being left to the commander of the group.

Paragraph 3 is subdivided into lettered paragraphs, corresponding with the lettered subdivisions under "*forces.*" Each of these subparagraphs under paragraph 3 begins with the name of the subdivision concerned underscored, followed by the word "will" and then a statement of the duty of that subdivision.

In paragraph 3 will usually be found dates and times. These will invariably be spelled out in full. The only abbreviations allowed in the body of an order are "a. m.," "p. m.," "Lat.," "Long.," "N," "S," "E," "W," "G. M. T.," "L. M. T."

All numbers of whatever character except paragraph numbers that occur in the body of the order or under "*forces*" must be spelled out in full. Courses and bearings shall be given in degrees from zero to 360, and shall always be defined as "true" or "magnetic."

Paragraph (x) contains instructions that apply to all of the subdivisions under paragraph 3, such as course, fleet speed, renedzvous, etc. Methods of communication are usually referred to under paragraph (x).

Paragraph (x) is intended as a means of making the order brief, instead of repeating direction for each subdivision of the forces under "(a)," "(b)," "(c)," etc., of paragraph (3). All of these directions that apply to all of the forces are assembled and placed in paragraph (x).

Paragraph 4 contains instructions for non-combatant units, such as colliers, supply ships, repair ships, hospital ships, corresponding to the military train. "Train" is used to indicate all non-combatant vessels that accompany the fleet, in default of a better term.

After paragraph 4 are inserted any additional paragraphs found necessary.

In the body of the order the composition should be as nearly as possible independent of punctuation, in order to facilitate accurate transmission by wireless, if that should be necessary.

In the last paragraph, or in paragraph 5 if no extra paragraphs are found necessary, is indicated where messages will reach the

commander of the whole force. Usually it is sufficient to give the location or intended movements of the flagship.

The order is signed by the name of the commander followed on the next line by his rank and on the 3d line by the word "commanding" and the name of the forces which he commands.

If signed by the chief of staff or by an authorized subordinate of the commander-in-chief, the words "By order of the C-in-C" should be written under paragraph 5, followed by the rank and title of the official acting for the C-in-C.

Below the line giving the title of the officer signing and to the left is noted to whom the order is sent, and in the next line how sent.

On the file copy of the order is an attest of delivery with the signature and rank of the officer responsible for the delivery.

In transmitting an order by wireless paragraphs 1 and 2 are sent and then "*forces*" are sent, after which the remainder of the order is sent as written.

After having been carefully worked out the order should be copied neatly and legibly and signed. It will sometimes appear that parts of the order are superfluous, especially when transmitted by signal or wireless. For instance, the list of forces when all forces are present; paragraph 4 when there is no train—in this case write the paragraph number and leave the line blank; also when an order is sent from the flagship, and no shifting of the flagship is contemplated. It is considered best to follow the form strictly and to fill it out entirely, to make sure that nothing has been forgotten.

In framing a solution it will be found much easier to understand the principles on which the order is based than to apply these principles to the case in hand.

Appended is an acceptable solution of a problem in the formulation of orders.

PROBLEM.

Situation.—War was declared between Red and Blue 18 January, 1909. The main Blue fleet left Guantanamo on that date for the Pacific via Magellan Strait. The Pacific detachment under command of Rear-Admiral J— is at Seattle. This detachment consists of 6 B, 4 C, 5 V and 3 colliers.

On 10 February, 1909, at 9 a. m., Rear-Admiral J— receives information that a large Red convoy of transports with escort was

sighted at 6 a. m. 8 February, in Lat. 51° 30′ N., Long. 160° W., steaming eastward, speed about ten knots.

Rear-Admiral J— decides:

1. To proceed to sea with his entire force at noon with a view to attacking the red convoy.

2. To form scouting line of 4 C 50 miles in advance of main body with 25 miles between vessels.

3. To keep armored cruisers and destroyers together.

4. To follow great circle course from Tatoosh towards point where enemy convoy was sighted.

5. To send colliers to rendezvous sixty miles S. W. of Cape Disapppointment.

6. To appoint a rendezvous for combatant vessels 20 miles west magnetic of Tatoosh Island.

8. To use cipher "B" for wireless.

9. To remain in B-1 with main body.

The Pacific detachment is organized as follows:

Division Ten.
REAR-ADMIRAL J——
B-1, B-2, B-3.

Division Eleven.
REAR-ADMIRAL H——
B-4, B-5, B-6.
REAR-ADMIRAL J—— commands.

Division Thirteen.
CAPTAIN W——
C-1, C-2, C-3, C-4.

Destroyer Division Seven.
COMMANDER F——
V-1, V-2, V-3, V-4, V-5.

Required.—Orders issued by Rear-Admiral J—.

SOLUTION.

Campaign Order No. 1.
Blue Pacific Detachment,
Blue B-1, Flagship,
Seattle,
10 February 09, 9,30 a. m.

FORCES.

(a) Scouts.
Captain W——.
Division Thirteen.
(b) Main Body.
Division Ten and Eleven.
Destroyer Division Seven.

1. A large RED convoy of transports with escort was sighted at six a. m., eight February in Lat. fifty-one thirty N., Long. one sixty W. steaming eastward at ten knots.

2. This force will proceed to sea to attack the RED convoy.

3. (a) The *Scouts*, when clear of SAN JUAN DE FUCA Strait, will

maintain scouting line North true fifty miles in advance of *Main Body*. Scouting distance twenty-five miles.

(b) The *Main Body* will follow Great Circle route from TATOOSH to point where convoy was sighted.

(x) Get underway at noon. Standard speed fifteen knots. Use cipher "B." Rendezvous twenty miles two seventy magnetic from TATOOSH Island.

4. Train will proceed to a rendezvous sixty miles two twenty-five true from CAPE DISAPPOINTMENT.

5. B-1 will be with *Main Body*.

J.,
Rear-Admiral,
Commanding Pacific Detachment.

Copies to
Rear Admiral H——, Captain W——, Commander F——.
Extract to Colliers.
By Guard Boat.
QUILL,
Flag Secretary.

NOTES ON SOLUTION.

The heading and numbering of the order follow the prescribed form.

"*Forces*" are written in the space allotted. As division thirteen is to form a scouting line the vessels of this division may be called "Scouts" or "Screen." The "*Main Body*" is composed of the armored cruisers and destroyers, but no commander of the *main body* is mentioned under "*forces*" as Rear-Admiral J—, the detachment commander, commands the main body.

In paragraph 1 is information of the enemy. This is complete, as the nature of the expedition requires that each unit have the fullest possible knowledge of the situation. Paragraph 1 contains no information of own forces as all such forces, under other command, are too remote to have any bearing on the contemplated movement of the Pacific detachment.

In paragraph 2 is a brief, comprehensive statement of the plan. "It is unwise to include too many details . . . . It is always important that subordinates should understand the object of what is ordered." This general statement of the plan is intended to further intelligent co-operation of the forces.

In paragraph 3 are the instructions for the subdivisions. These instructions do not carry the plan beyond the first hostile contact. Rear-Admiral J— wisely decided to await that contact and then

adjust his further plan to the situation then obtaining. It would be desirable for Rear-Admiral J— to formulate plans of action to fit possible situations resulting from hostile contact if there were sufficient data available on which he could base such plans. As, however, he is not informed of the strength or disposition of the escort he is compelled to await further information.

The remainder of the order needs no discussion.

Some officers may think the tactical dispositions faulty, the decisions of Rear-Admiral J—, as stated in the problem, unsound, but such questions are not involved in the solution. The problem is to embody the decisions of Rear-Admiral J— in a clear, brief order arranged in logical sequence in accord with the spirit of a form that has been found by experience suitable.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE ORIGIN OF OUR SIGNAL BOOK.*

By LIEUT.-COMMANDER RALPH EARLE, U. S. Navy.

In order to give the origin of our present signal book it is necessary to mention briefly the lives of the English commanders and the conditions under which they developed it.

For our Revolutionary War, England was thoroughly unprepared principally through her own mal-administration. In Europe all her old time enemies seized this opportunity to injure her by throwing in their lot with America and thereby possibly gain some advantage to themselves. Thus England was hard put to provide ships and men for her navy on the coast of America.

Lord Richard Howe, who was born in 1725, became an admiral in the English Navy when the Revolution broke out, and was appointed to the command of the insufficient naval forces operating in America against the colonies. Despite the far more powerful French fleet of Count D'Estaing, he relieved Philadelphia, later frustrated the French attempts on New York and Newport, and compelled the French to sail for the West Indies. Yet he never in this campaign won a single victory.

While busy with this task he started the compilation of a signal system.

At this time, the English Navy, though suffering reverses on all sides, was the best and most efficient in the world, yet its signal code, and probably the codes of all nations, was certainly very crude.

All information and directions to commanders of ships as to how to act in battle were at that time contained in the *Fighting Instructions*. This code originally contained less than 20 maneuvers, and to signal these was a comparatively simple matter. The complete signal code was composed of these five

* All the information in this article is taken from *Sea Kings of Britain*, Vol. 3, by G. A. R. Callender, B. A., of the Royal Naval College, Osborne, published by Longmans, Green & Co.

flags, one red, one white, one blue, one yellow and the union jack. The one requirement stipulated in those days for signals, that they be instantly recognized when hoisted, was thus obtained. To make more than five signals the flags were used in this way: Each flag meant a single message, but the particular message depended on the place where it was hoisted; thus, the fore truck, main truck, mizzen truck, spanker gaff and after flag staff were used as places for hoists, and thus these five places and five flags gave 25 possible signals.

Lord Anson, when first lord, however, had authorized the issuance of additional instructions, and thus it came about that there was no means of signalling them, and confusion became the order of the day.

A sample page of the famous *Fighting Instructions*[1] is reproduced herewith.

Number.	Fighting Instructions.	Flag.	Where Shown.
I	Line ahead.....	Union Jack.....	Mizzen-peak.
IX	To go about beginning with the van..	Union Jack.....	Fore-top.
X	To go about beginning with the rear..	Union Jack.....	Mizzen-top.
XIII	Battle.....	Red.....	Fore-top.
XVI	Fill sails and carry on.....	Yellow	Fore-top.
XVII	After passing the enemy on opposite tack, to go about all together.	Union Jack.....	Fore-top and at mizzen-top.

Number.	Additional Fighting Instructions.	Flag.	Where Shown.
XV	*Hawke's Quiberon Maneuver.*—To chase, and leading ships to form while chasing.	Red with white cross.	Main-top.
XIX	*Vernon's Maneuver.*—Closer action.	Half blue, half white.	Fore-top. N. B.—Under "Battle Flag."
XIV	*Hawke's Finisterre Maneuver.*—When in chase to pass on disengaged side of those already engaged.	Dutch Flag.....	Main-top.
XXVI XXVIII	*Rodney's Martinique Maneuver.*—To mass attack on a part of the enemy's line.	Spanish Flag.....	Fore-top.
XXXV	*Rodney's "12 April" Maneuver.*—Cutting the enemy's line.	Blue and yellow chequer.	Fore-top.

These were compiled in a hopeless muddle, no system, no beginning, end, or method whereby a signal's meaning could be determined save by a frantic hurried search through many pages.

[1] From *Sea Kings of Britain*, Vol. III.

Lord Howe originated and completed the compilation of the first signal book while still in command in America. His arrangement of subject matter was this: A page was devoted to the use of each flag. On each page was arranged the several meanings that the flag of the page might have.

Lord Howe returned to England in the fall of 1778 to find an entirely unsympathetic and unappreciative populace, the insults of which impelled him to retire from the service in a manner similar to Lord Keppel.

We remember that Lord Keppel, one of England's greatest admirals, at Ushant in July, 1778, doing his best, which means he did wonders with an inferior force, was unable to make the fight a decisive victory, and because of this was court martialed but most honorably acquitted. He felt, however, that as the ministry in power had put him on trial for his life he could not again serve under them, and so he resigned, thus leaving the direction of affairs in the Channel without a head.

Lord Howe, on his retirement, turned over his signal book to his friend, Captain Richard Kempenfelt, then senior officer in the Channel, no successor for Keppel having been appointed.

Kempenfelt was interested and enthusiastic in this work and determined that the whole system of the *Fighting Instructions* should be abolished because of their utter inefficiency.

A study of the early battles fought under these instructions show one that all the victories would have been made more complete and defeats less disastrous if a signal code had existed. For example: if Lord Keppel at the Battle of Ushant, July 27, 1778, could have made his point of view known to Sir Hugh Palliser of the *Formidable* the result would have been a glorious victory in place of an inconclusive fight; Rodney's strategem and the completeness of his success at the Battle of Martinique, April 17, 1780, was ruined by Carkett in the *Stirling Castle* leading the van, who incorrectly interpreted the construction Rodney wished placed on Instruction XXI, and Rodney on account of defective signal methods was unable to impart his commands to the erring commander.

Kempenfelt at work on Howe's signal book invented or evolved the *Numeral Code,* deriving possibly some assistance from French sources, which, however, no one but himself would have troubled to study. He used 16 flags, and each flag was al-

lotted a page in the book. The significations were not sorted out under each flag. The flags signified 16 numerals (1 to 16). Each was used in turn to give a page its numerals and on each individual page the whole 16 were grouped again, thus allowing of 16 entries per page. The masts or locations in which a flag was hoisted no longer formed a part of the code. Two flags were required in each hoist, and the message conveyed was thus interpreted: A hoist of 8 and 14 was read by turning to page 8 and reading entry number 14. The combinations possible were thus 16 times 16, giving 256 possible signals logically arranged and quite easily found.

So Kempenfelt at last laid the foundation for the present signal codes in use by the navies of the world. Nelson without this signal system would have been nearly helpless at Trafalgar, while with it at Martinique Lord Rodney could have prevented Carkett from ruining the hope of his life.

In 1782 the administration changed, Lord Keppel becoming first lord of the Admiralty, and Lord Howe was at once called from his retirement and placed in command of the Channel Fleet. Here Kempenfelt was chosen as his flag captain, and together the two officers issued the *Signal Book* in its earliest working shape.

Kempenfelt was unfortunately drowned when the *Royal George* sank at her moorings in Portsmouth Harbor on August 29, 1782.

During the next twelve years Lord Howe left thus without his able co-worker carried on the work, amending, correcting, improving the code, but above all getting it recognized and adopted in the fleet. The signal success of all his campaigns and his final victory completely popularized the *Signal Book* with the service.

Lord Howe's remarkable career had its greatest victory in his defeat of the French in 1794 at the battle known as the "Glorious First of June." Then after he had calmed the famous mutiny of 1797 he was allowed to retire from active service. He died in 1799.

This article serves to indicate the condition of signals at the time of the Revolution, each captain being apparently compelled to work out his own, and as giving one of these codes the article which follows on the signal system of Samuel Barron may be of interest.

Signals to be Observed by Vessels under the Convoy of U. S. Ship Baltimore under my Command.

No. 1. To get under way (to be hoisted at the fore)

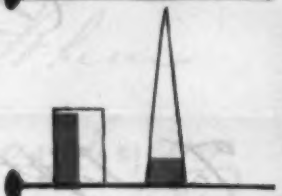
2. To Anchor — (to be hoisted at the main) The same as above

3. The fleet to make Sail — — — —

4. To Shorten Sail — — — — —

5. To tack or Wear and Stand the Other way

6. To follow the Commander



7. To Sail in Close Order

8. To Speake the Commander

9. The Sternmost ships to make all the Sail they Can. So as to keep up with the Fleet

10. The Fleet will Leave too with her Starboard Tacks on board

11. The Fleet will Leave too with the Larboard tacks on board.

12 For the fleet to make Sail after laying by and the same course they were before Steering &c } Red Ensign at the

13 The fleet will disperse ——— }

14 For the fleet to rally arround the Commander as near as possible and Carefully Observe his Motions during the Night ——— } English Ensign at the Fore

15 For the fleet to take their own Course the Commander about to depart from the Convoy } English Ensign at the Main

N: 16 For the fleet to Continue their Course and Under the same Sail & not attend to the Motions of the Commander ——— } a Dutch Jack at the Mizen T. Gill Head

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Signals by Night

Signals by Night

Two Lights abreast	The Fleet to sail as near the Commander as possible
One Gun and two Lights	To tack or wore and stand the other way.
Two Flashes of Powder & three lights in a range	To lay too on the Starboard tack
Two Flashes of Powder & Four lights in a range	To lay too on the Larboard tack
One Gun and One Light	To make sail after lying by and follow the Commander
3 do & Two Do	The Convoy to disperse
2 Do & One Do	To haul by the wind on the Starboard tack
2 Do & Two Do	To haul by the Wind on the Larboard tack
A Light hoisted and Lowered three times, at two [redacted] minutes intervals	Stormmast Vessels to make all the Sail they can

Four lights abreast, with one gun a Flash or Partfire — To keep upon course but to the motions of the Commodore

Note.

Should a Strange sail be discovered by any of the Fleet by day, they will hoist their Colours and if they are desirous of Speaking the Commander their Colours to be hoisted in a Whift —

These Lights are to be considered as independent of the top lights, which will be carried when I think it necessary - and at times Port fires or Flashes of Powder will be used instead of Guns being fired — It is expected the Vessels will keep as near the Baltimore as possible and neither go too far a head or on the Wings of the fleet but endeavour to sail as compact as possible, by which means they can more easily afford them

to sail as compact as possible, by which means she can more easily afford them protection in case of surprise by an Enemy

If you discover any appearances that you dont like, you will immediately hoist a light and Lower it at half minute intervals untill it is Observed by the Baltimore, at which time it will be answered in the same manner as made by you, taking care at the same time to speak her with all possible expedition — whenever a signal is made by the Commander, the whole fleet will give notice that they observe it, by hoisting a light each, which will remain in view two minutes — Should any accident happen to disperse the Fleet unless circumstances

render it improper) observe the Sail which may carried
the course steered by the Commander at the commencement
of the Evening and endeavour to make the same course
and distance which would have been gained, had there
been no interruption in their progress — By which means
the Commander will most probably join them during
the night or in the morning — It is necessary
to pay attention particularly to all those different
signals & that I hope you will consider the consequences
attending the smallest neglect — as the safety of the whole
fleet depends on your observance of every part of these
instructions — No Lights are to be shewn by any
of the Fleet unless meant for signals, they are means
to go a head of the Commander or the ship who may carry

instructions — [illegible] of
of the Fleet unless meant for signals, they are necessary
to go a head of the Commander or the ship who wears
the white Pendant - as the leading ship - which may
at time be necessarily employed in that service
& when this is the case her course is carefully to be
observed and followed - when a Strange is discovered
by any of the fleet to windward their Colours must be
hoisted at the main if to the leeward then at the Fore

In addition to the first signals delivered, it is
necessary to form a few others viz -

The Fleet will sail on the Starboard } Dutch Jack
Quarter of the Leading Ship — } at the Main

The fleet will sail on the Larboard } Dutch Jack
Quarter of the leading ship — } at the Fore

St Thomas 15th April 1799. Saml Barrow

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SIGNAL CODES USED BY OUR REVOLUTIONARY COMMANDERS FOR THE CONVOY OF MERCHANTMEN.

By GILBERT TOTTEN MCMASTER, M. D.

It will be recalled that during 1798 Captain Barry, U. S. N., while off Cape Cod, made out a frigate showing French colors. He ran up the same. The two maneuvered for position. The American gained the advantage, was closing, when the frigate broke away, the British ensign announced her name *Thetis* and rating. Then and there the British admiral suggested a set of signals by which American and British should know one another and thereby avoid an unpleasant experience.

The code was adopted. This set of signals for convoying merchantmen may be the same that I submit here as an historical navy curiosity. I say "may be"; I make no positive assertion. They were the property of my great-grandfather, Gilbert Totten, Esq., master of the good ship *Mary*. She, with many others of her class, was convoyed by the U. S. S. *Baltimore*, Samuel Barron, Captain, U. S. N., commanding from St. Thomas to American ports in 1799.

These ancient hand-painted code signals are indeed a contrast to the elegant book now issued to officers of the navy by the Department. The "Young Gentlemen" of the old frigates sat up late, strained their tired eyes, wrote with quills and muddy ink, and were enjoined to haste in a flow of adjectives that bespoke the heartfelt soul. Steel pens, typewriters and electric lamps were unknown. Only spluttering, thick ships' candles, of unpleasant odor, and sand to dry the ink, did the navy men use. Several times one may observe where the "Young Gentlemen" crossed out a word, from sheer exhaustion. He has pulled his hard-as-nails individuality together again and gone at it. Nevertheless, it is so

neatly executed I take pleasure in submitting the work of this forgotten and unknown midshipman of long ago to his present brethren, the officers of the United States Navy.

SIGNALS ADOPTED BY THE COMMANDER OF THE U. S. S. GEORGE WASHINGTON IN 1799.

SIGNALS BY DAY

For all Captains to come on board the Commodore A Dutch Ensign
For the fleet to weigh and make sail out of the Harbour
A Portugues Ensign
For the sternmost Vessels to make all the sail they can
A French Ensign
For the fleet to make the best of their way close to the wind
An English Ensign
For the fleet to make the best of their way large or from the wind
A Spanish Ensign
For the fleet to observe the motions of the Commodore & attend to them *An American Jack*

Should any of the fleet be in distress and not able to keep up with the Commodore, they will hoist their Ensigns at the Maintop Gallant or Topmost head—

If any of the Fleet wants to speak the Commodore he will hoist his Ensign at his Foretop Gallant, or Topmast head—

Should any of the Fleet discover a strange sail, he will haul up his Foresail, lower his light sails and hoist his Colours—

For the fleet to keep close to the Commodore, he will hoist a white Flagg—

For the headmost Vessel to heave to, to let the sternmost come up *.A Red & white Flagg—*

SIGNALS BY NIGHT

Should any one of the fleet discover a strange sail, he will hoist a Lanthorn in the best place to be seen & fire a Gun, if he has one—

The fleet will be careful not to go ahead of the Commodore, as he will carry an easy sail all Night that the slow sailing Vessels may keep up—

The Fleet will be very careful to keep close together—

Should any of the fleet either by day or by night run ahead or keep at such a distance as the Commodore thinks imprudent, & he has occasion to fire a Gun, they are to observe for every Gun he

fires he will make the offender for the first pay two Dollars, the second three & all after four—

If the Fleet is to shift for themselves the Commodore will hoist two lights, one over the other & if convenient fire a Gun

The Commanders of Merchant Vessels will please to pay the strictest attention to the signals as it will be the means of expediteing the Convoy, & to take care to destroy them in case of Capture

On Board Geo. Washington Prince Ruperts Bay
Febʸ 1ˢᵗ 1799—
Patᵏ Fletcher

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

HIGH PRESSURE TURBINE PUMPS.*

By LIEUT. (J. G.) V. V. WOODWARD, U. S. Navy.

In the present day the rotary principle of the turbine seems to be the ideal taken for the motion of all primary machines, and the reciprocating principle is gradually losing its prestige in the mechanical world In no field has the rotary principle experienced such marked success in the last few years as it has in that of high lift or high pressure pumping, although the realization of its possibilities for such duties is perhaps older than that of the steam turbine itself. The present use of the turbine pump has extended into such a wide field that it is difficult to find services to which it cannot be advantageously applied.

It might therefore be of interest to take a few moments to trace the development of machines of this design, beginning in the early part of the eighteenth century when the first crude machine that conceived the turbine idea was brought into use. This rotary contrivance was for the purpose of raising water from a lower to a higher level, and it is the forerunner of pumps of the turbine type. This pump was designed and built by a Frenchman, and consisted of an inclined tube made fast to a vertical shaft by arms, the lower end of the tube being immersed in a pool of water to be raised to the higher level. When the shaft was revolved in the proper direction the water was lifted up and ejected from the top of the tube, the height the water reached depending upon the velocity of rotation of the shaft. Fig. 1 shows a rough sketch of this crude pump. The driving power was probably transmitted to the shaft by means of a belt and pulley.

About the same time another Frenchman devised an improve-

*A lecture delivered before the School of Marine Engineering, Annapolis, Md., April 8, 1912.

ment in what was known as the Hessian Bellows so that they might be applied to both "wind and water."

NOTE.—From the little information obtainable on the Hessian Bellows, I would take it to be a rotary contrivance of some sort used for the ventilation of mines. It is interesting to note here the development of the centrifugal pump made in one step, that from the crude machine shown in Fig. 1 to the paddle wheel impeller type shown in the Hessian Bellows. The impeller as used today is the same as that of the Hessian Bellows, except that modern developments have introduced curved blades.

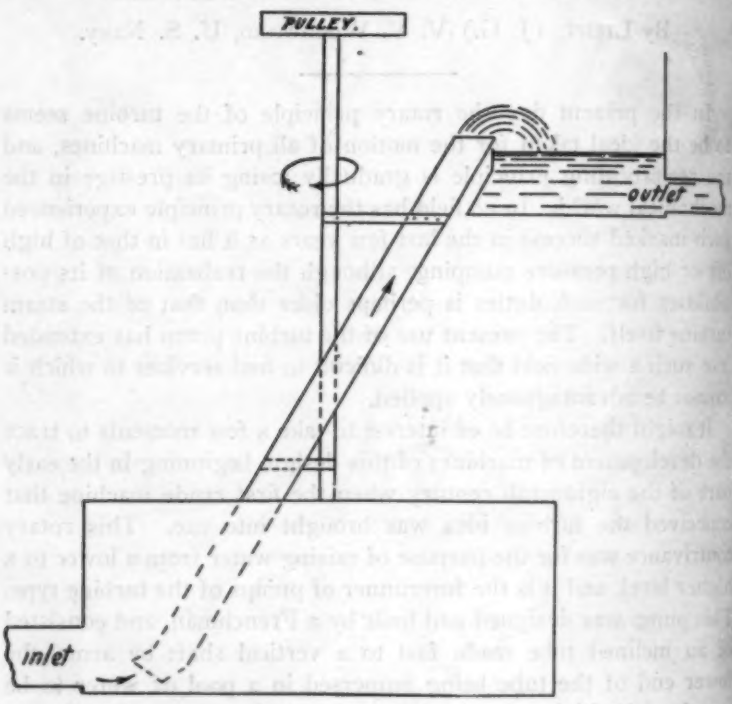


FIG. 1.

The Frenchman's improvement in this ancient apparatus consisted in enclosing his radial wings or paddles in a cylindrical chamber, the portion of the chamber around the periphery of the wheel being spiral in shape. The drawings of this machine show clearly the volute casing of the modern centrifugal pump. At the time of the completion of this fan machine there was no means of driving it other than by hand, so that it was about a century later, when steam motive power came into existence, before the ideas were carried out in actual practice.

In the past, centrifugal pumps were considered by engineers, and accepted by them, as being a suitable means for easily and cheaply raising water to low heads. Further than this they were useless. It was not realized that they were capable of dealing with high heads or pressures, in fact, this idea became the generally accepted rule in engineering practice and it took many years of strenuous effort on the parts of the deeper thinking engineers to remove it. It is shown, however, by the patents of one Gwynne, an Englishman, that the above rule was not altogether universal. Included in his patent papers is the design of a series or multiple stage centrifugal pump with four wheels. This patent is the first proposal on record for the use of the centrifugal impeller in series, and though the form of his impellers (being flat or radial like a paddle), and his pump having no guide vanes in the casing, would prohibit it from having even a low efficiency with the heads dealt with to-day, still it shows the conception of a machine quite a good deal in advance of the times.

Although the water turbine with its vanes was a matter of common knowledge at this time, there appears to have been no attempt made to reverse its action for the purpose of raising water under higher heads and with a corresponding high efficiency. It was not until about 1825 that an invention did embody the reversal of the turbine action for the accomplishment of the above mentioned purpose. This consisted in incorporating the curved vanes of the turbine in the casing of the pump, the vanes being so shaped that there is an easy conversion of the kinetic energy of the water leaving the impeller blades, into pressure in the pump casing. The first turbine pump developed along these lines was used in the Navy Yard, New York, in 1830. Since that time the pump has developed rapidly and has finally reached the stage of the pressure turbine pump which is being used at the present time for boiler feed and other duty requiring high lifts.

A centrifugal pump is exactly the reverse of the turbine wheel. In the turbine the water approaches the wheel with a high velocity and in a direction making a small angle with the direction of motion of the circumference of the wheel, and thus the water has a high velocity of whirl which it imparts to the wheel. When the water leaves the wheel its velocity is small and the velocity of whirl should be zero. In the centrifugal pump these conditions are entirely reversed; the water enters the wheel with a small velocity

and leaves it with a high velocity. If the casing surrounding the wheel admits of this velocity being diminished gradually, the kinetic energy of the water is converted into useful work, but if not, it is destroyed by eddy motions or currents in the casing, and the efficiency of the pump is accordingly low.

The simplest form of the centrifugal pump is one in which the water enters the impeller wheel at the center, either under head or by vacuum produced by the rotation of the impeller, the water then gradually acquires the velocity of the impeller as it proceeds towards the ends of the blades and it is finally thrown off into some whirlpool chamber which encases the impeller. Suppose the velocity of water leaving the impeller blades be v feet per second, then as each pound of water leaves the impeller the reaction retards the impeller with a force $\frac{v}{2g}$, this force multiplied by v $\left(\text{which equals } \frac{v^2}{2g}\right)$ is the kinetic energy per pound of water received per second from the impeller. This energy is gradually changed into pressure in the whirlpool chamber, and by the time the water reaches the delivery pipe it has a sufficient pressure to force it up the pipe. The efficiency of the pump depends primarily upon the curvature of the impeller blades and upon the shape and size of the whirlpool chamber with its guide vanes. The theoretical height to which a pump will raise water is given by the familiar formula $v=\sqrt{2gh}$ (the velocity acquired by a body falling from the height h). In the case of the pump v would be the velocity of the periphery of the impeller and h would be the height to which the water would be raised by an impeller turning at this velocity. In actual practice, however, the height h is reduced somewhat by friction losses and eddy currents.

It has been proved experimentally that water cannot pass along a path of suddenly changing curvature without loss of energy, and this loss will become greater the greater the velocity of the water. Upon this fact depends the designing of machines like centrifugal pumps and turbines which act upon or are acted upon by water. If water be compelled to flow along a pipe which suddenly changes in diameter, it produces in itself little whirls or eddies which act like wheels to help it around the corners, just as rollers under a log help the log to be moved more easily. But wherever such eddies are set up energy is wasted, not only around the corners but by the smaller

eddies which are set up and carried along by the water. Suppose we make the water flow along the pipe shaped as at A in Fig. 1a, there will be eddies set up carrying the water around the curvature from A to C. If the water flows along a curve at N and it is made to pass around a similar curve at M, you do not experience as much waste of energy in the second curve M as you did in the first at N; but if the water first pass along a curve at R and then around a curve at S, similar but bent in the opposite direction, you will get fully as much waste at S as you did at R. The little eddies created at N are available at M but those produced at R

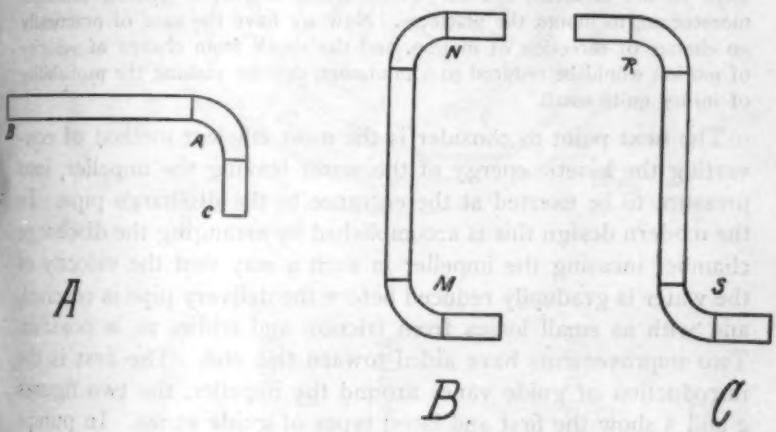


FIG. 1A.

have to be destroyed and new ones created rotating in the opposite direction in order to carry the fluid around the curve at S.

It is evident then that in order to reduce the loss of energy as much as possible, great care must be exercised in designing a centrifugal pump or turbine; to provide for the water a path free from abrupt changes in direction. The angles for the vanes and any other guiding surfaces must be properly determined and placed so that the water may pass into and out of the impeller without sudden change in direction or velocity, and all curves should have a gradual change such as would be obtained if we could use an elastic material of some sort in the place of the metal used in the construction of the pump. It is most important that the angle of the base of the impeller blades must be such that the water will not receive shock on entering the moving wheel, and the direction of

flow must be as nearly as possible the same the instant after entering the impeller as it was the instant before entering. This fact is clearly illustrated by a simple analogy as follows:

Take the case of a swiftly moving vehicle of any kind, such as a street car. We wish to board the street car while it is in motion. It is almost a certainty that you would hardly find a person who would wait until the car had arrived opposite him, and then throw himself in a line at right angles to the motion of the car upon the platform. If the car were moving at all rapidly, the shock resulting from abrupt change of direction of motion would most probably result in serious injury to the person. The logical method of boarding the car would be to run alongside for a few steps in the direction the car was moving, and after gaining sufficient momentum, to mount the platform. Now we have the case of practically no change of direction of motion, and the shock from change of velocity of motion would be reduced to a minimum, thereby making the probability of injury quite small.

The next point to consider is the most efficient method of converting the kinetic energy of the water leaving the impeller, into pressure to be exerted at the entrance to the discharge pipe. In the modern design this is accomplished by arranging the discharge chamber incasing the impeller in such a way that the velocity of the water is gradually reduced before the delivery pipe is reached, and with as small losses from friction and eddies as is possible. Two improvements have aided toward this end. The first is the introduction of guide vanes around the impeller, the two figures 2 and 3 show the first and latest types of guide vanes. In pumps fitted with guide passages or vanes, the water is discharged into a certain number of narrow channels distributed around the circumference of the impeller, these channels diverging outward. The vanes are generally cast in the section of a hollow cylinder which fits around the impeller. Its inside circumference is carefully machined to make a smooth running fit with the impeller. As will be seen from Fig. 3, the modern guide passages are so shaped that the entering angle from the impeller will be the same as the angle at which the water leaves the impeller blade tips. The vane passages work on the familiar theory of the Venturimeter, *i. e.*, the whirling velocity of the water from the impeller gradually decreases and the hydraulic pressure gradually increases as the ends of the passages are approached. If the vanes are carefully and properly designed the total energy of the water, minus friction and eddy losses, will be converted into pressure by the time the water has reached the whirlpool chamber, the velocity

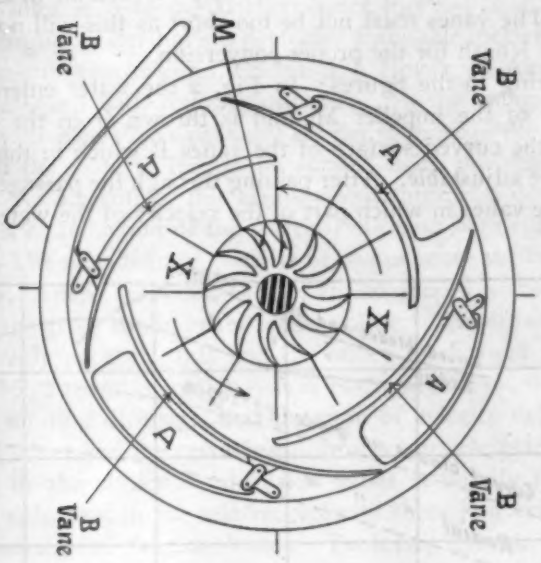

B Vane
M
B Vane
A
A
X
X
A
A
B Vane
B Vane

FIG. 2.

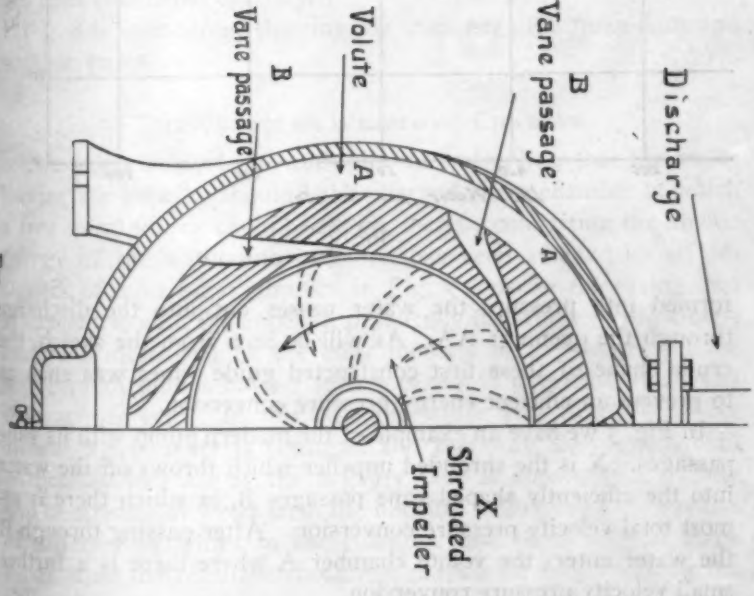

B Vane passage
Volute
B Vane passage
Discharge
A
A
X Shrouded Impeller

FIG. 3.

at this point being as low as six feet per second in an efficient pump. The vanes must not be too short as this will not allow of sufficient length for the proper conversion.

Referring to the figures: In Fig. 2 the water enters through the eyes of the impeller M, and is thrown from the blade tips against the curved surface of the vanes B which in this old type was made adjustable. After passing through the passages between the guide vanes in which part of the velocity of the water is trans-

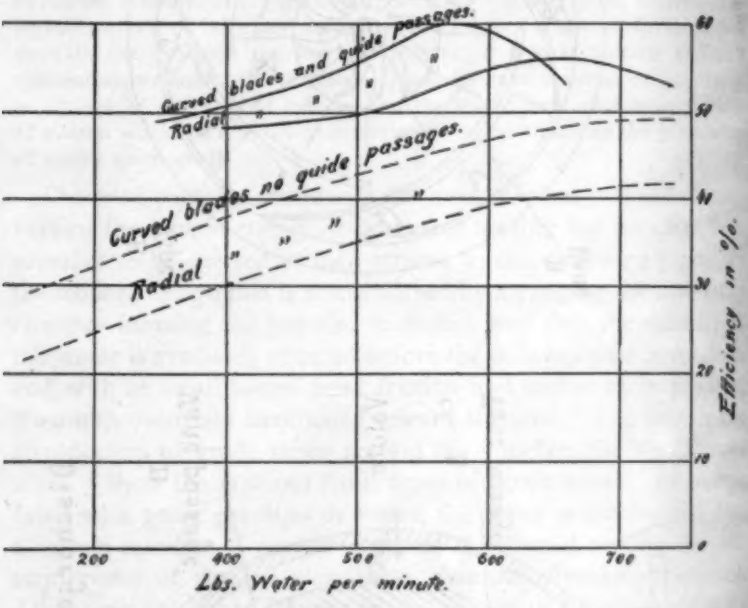


FIG. 4.

formed into pressure the water passes out into the discharge through the openings AA. As will be seen from the sketch, the crude shape of these first constructed guide vanes was such as to prevent an efficient energy pressure conversion.

In Fig. 3 we have an example of the modern pump with its vane passages. X is the shrouded impeller which throws off the water into the efficiently shaped vane passages B, in which there is almost total velocity pressure conversion. After passing through B the water enters the volute chamber A where there is a further small velocity pressure conversion.

A late design of the diffusion vane plate or diffuser has been along the lines of reducing friction, since this has been the purpose of designers after having perfected a suitable method for the energy pressure conversion. Professor J. Novak, of Austria, has designed a pump with rotating diffusers. In this pump the diffusers or vane plates have passages similar to those in the ordinary pump, but the plate is free to be rotated upon the shaft of the impeller. As a result of this arrangement there is a decided advantage; *i. e.*, reduction of the water friction on both sides of the impeller. The new diffuser consists of one or more shells rotating separately. These, as stated before, are so shaped as to form an easy passage from the impeller to the volute. The diffuser shells revolve freely on their axis and the water discharged from the impeller keeps them in motion. It is easily seen then, bearing in mind the rotating diffusers, that the ratio of velocity existing between the water and the revolving diffusers is much less than that produced by the stationary diffusion vanes ordinarily used, and with this reduction in the relative velocity there is a very appreciable lowering of friction losses. Professor Novak gives an increase in efficiency of the rotating diffusers over the stationary diffusion vanes of 20 per cent. This figure is the result of numerous tests conducted by himself.

Fig. 4 is interesting, showing the efficiency of a pump with and without vanes.

THE VOLUTE OR WHIRLPOOL CHAMBER.

The suggestion of one authority on hydraulics, that the water leaving the impeller should be discharged into a chamber in which a free spiral vortex could be set up, thereby converting the kinetic energy of the water into pressure, has been adopted by all designers of centrifugal pumps. In Fig. 5 consider the casing that is concentric with the impeller, practically the whole of the kinetic energy is destroyed by the eddy motions of the water and the efficiency of pumps having such a casing is generally much less than 50 per cent. In this type the water area of the chamber around the impeller is constant, and therefore the velocity will continually increase as the delivery pipe is approached. There will be streams of water from the impeller impinging with streams of different velocities in the chamber, and there will be large losses from the resultant shock. A particle of water leaving the

impeller at the top of the casing has a certain velocity, by the time it has reached the bottom of the casing the velocity of this particle has increased, due to constant area of chamber, but the water coming off the impeller at this point (the bottom), has the same velocity that the first particle originally started with, hence it can be readily seen that as the particle with the high velocity strikes the particle with the low velocity that there will be shock, which as stated means loss. Also there is a large loss from eddy currents, for the reason that as we proceed from the top of the impeller around to the discharge, the volume of water is constantly increasing and there has been no allowance made for it by gradually

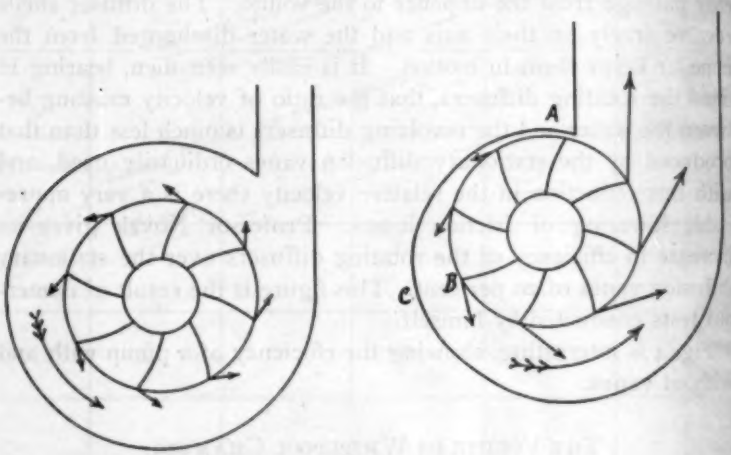


FIG. 5.

increasing the volume of the chamber. The effect of this is to set up small whirls and back currents.

In order that there shall be a minimum waste of energy in the whirlpool chamber the water must follow a law known in hydraulics as the law of natural flow, *i. e.*, the velocity of the water traveling in a spiral path varies inversely as its distance from the center of the spiral. Hence the adoption of the spiral chamber or volute. It can be seen from the second sketch in Fig. 5 that as the water progresses toward the discharge pipe its spiral path takes it farther from the center of the impeller with the proportionate decrease in the velocity. In this instance the impeller is eccentric with the casing, and at the top the impeller makes a close fit with the casing. Since the impeller discharges uniformly

all around, the area of the section between the casing and the impeller at any point, say at BC, is made proportional to the volume of water discharged from the wheel between the point at the top and the point half way down BC. That is, the width of the chamber at BC will be proportional to the water discharged from the impeller between the point A and the point BC. The sketch shows a casing which will satisfy this condition. In construction the casing is widened out perpendicular to the paper intead of laterally. This form (the gradually increasing area of water space) permits of a uniform velocity around the casing and consequently there is very little loss of head from the shock of water of different velocities impinging on each other, as was the condition in the first type of chamber. Before the introduction of guide vanes the above casing was the type used on all pumps, it is called a volute. The same casing is used in the design of all modern pumps except that the guide vanes are introduced and the impeller is not placed quite so near the top of the casing. Fig. 6 shows a line sketch of the casing with the guide vanes installed.

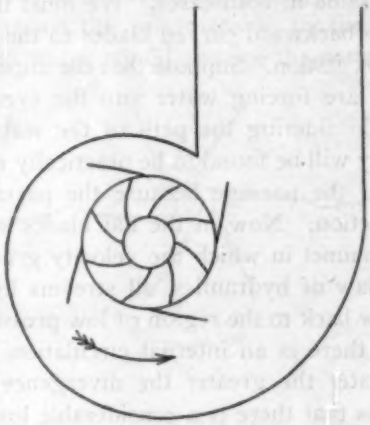


FIG. 6.

THE IMPELLER.

Another important point in the design of the centrifugal pump is the curvature of the blades of the impeller: the blades being either flat (radial), backward curved, *i. e.*, curving away from the direction of rotation of the impeller, or forward curve, *i. e.*,

curving toward the direction of rotation of the impeller. It has been proved that the efficiency is considerably less with the flat and forward curved blades than with the backward curved blades, and for this reason and others mentioned later the impellers of all modern pumps are of the backward curved type.

From experiments conducted on two seven inch impellers, one with flat blades and the other with the backward curved blades, it was found that the efficiency of the latter over the former was about 8 per cent, and remained constant at all points of the revolution quantity curve, and the horsepower applied to the shaft was about 22 per cent less in the case of the backward curved blades. We can assume, and the assumption is a true one, that the friction loss of the water is the same in both cases. We must then attribute the superiority of the backward curved blades to the small amount of slip or internal circulation. Suppose that the impeller is at a standstill and that we are forcing water into the eyes under pressure of some sort. Considering the path of the water in the curved blades the velocity will be found to be practically uniform throughout the length of the passage because the passage is of almost uniform cross section. Now in the flat blades we have the case of a diverging channel in which the velocity gradually decreases. According to a law of hydraulics, all streams in a channel have a tendency to flow back to the region of low pressure from whence they came, *i. e.*, there is an internal circulation or back flow set up which is greater the greater the divergence of the channel. A result of this is that there is a considerable loss in energy, and going on the assumption that this back flow does take place in the channel between the flat blades, it is evident that the work absorbed will be greater when this circulation does not take place, as is the case with the backward curved blades. This is the chief reason for the greater efficiency of the backward curved blades (*i. e.*, the very much less divergence of the channel between them), and leads to the conclusion that for maximum efficiency the blades of the impeller should be so designed that the velocity of flow through the impeller is practically constant. This, of course, refers to the impeller at a standstill; when running the water in the channels would gradually increase in velocity as it approached the ends of the blades, due to the centrifugal force of the rotating impeller, which is the object sought, and is a condition that must exist. The curves in Fig. 4 show the efficiency in the two types

of blades. Figure 7 is self explanatory and shows what is meant by the different types of blades.

One of the advantages of the backward curved blades is that it is possible to vary the amount of water discharged by varying the speed of the impeller, whereas this is not possible, to any appreciable extent, with the flat or forward curved blades. With flat or forward curved blades the kinetic energy of the water as it leaves their tips is very much greater than in the case of the backward curved type, and this energy is so great that an enormous volute would have to be constructed in order to allow of the energy being converted into pressure. The prohibitive size of the volute required is one reason for not using this type of blade. Also the great stress set up on the volute casing by the centrifugal force of the discharged water would require the casing to be made of

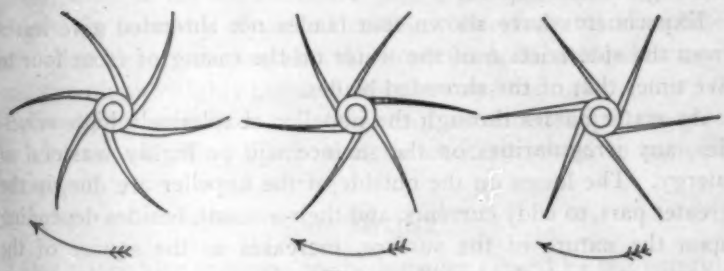


FIG. 7.

infinitely strong and heavy material, the requirements in this case being such that they could not be fulfilled mechanically. There is one case on record of a test of a specially constructed pump of very small dimensions using flat blades and working against a lift of 350 feet, where the pressure in the volute casing due to the centrifugal force was 7250 pounds per square inch.

The use of the backward curved blades allows us to use a casing of small dimensions, due to the small value of the kinetic energy of the water leaving the impeller, their use also gives us very much better efficiency for the reason that the losses due to the shock of water on entering and leaving the impeller are greatly reduced over that experienced in the flat blades.

All impeller blades are now made shrouded, *i. e.*, the wheel is made with two flat faces and the blades are set down between the faces, or better the blades are cast with the wheel. The open impeller, that is, the paddle wheel type, not only gives rise to ex-

cessive friction due to the contact of the rapidly moving water in the impeller with the stationary pump casing, but eddies are set up between the edges of the impeller and the casing. The shrouded or inclosed impeller is not subject to these losses, as the retaining shrouds or side plates revolve with the blades and with the contained water. The blades of open impellers must run close to the pump casing in order to prevent leakage. This trouble is not present with the shrouded impeller, which can run with a reasonable amount of clearance, although for the best efficiency this should be as small as possible. Most impellers are made of bronze, the metal best adapted to withstand the action of water and retain their original shape and smoothness. Bronze also takes a high polish and permits of more accurate castings being made. Impellers are all hand finished, inside and out, polished, and then balanced at a high rotative speed.

Experiments have shown that blades not shrouded give losses from the side friction of the water on the casing of from four to five times that of the shrouded blades.

As water passes through the impeller at relatively high velocities, any irregularities on the surface will be highly wasteful of energy. The losses on the outside of the impeller are due, in the greater part, to eddy currents, and their amount, besides depending upon the nature of the surface, increases as the square of the velocity at which the impeller travels. To generate a given pressure or head, the periphery of the impeller must run at a certain definite velocity. Then a square inch of the outside surface of the impeller will meet a certain resistance as it revolves, which multiplied by the impeller velocity will give us the rate at which energy is being wasted. Therefore, of two pumps generating a given head, the larger diameter impeller will have a greater number of square inches of surface moving at any given velocity and will therefore waste more energy. The surface of a circle varies as the square of the radius so that the external impeller friction for a given head varies as the square of the radius of the impeller. It is at once clear that the smaller we can make our impeller for a given duty the more efficient will be our pump. Hence all designers of modern pumps make their impellers as small as is possible and yet do the work required of them.

A short explanation of an item mentioned in the early part of the paper. In practically all cases of discs or wheels rotating in water, the resistance to motion is smaller the less the clearance

between the moving part and the sides of the vessel in which it is contained. Therefore all side and end clearances of the impeller should be cut down to a minimum; also the casing and impeller should have machined and polished surfaces. From experiments made on several twelve inch impellers it was found that a rough cast iron impeller revolving in a rough cast iron casing absorbed 2.9 horse-power at 2000 r.p.m. with a side clearance of ⅝-inch, while the same impeller in the same casing, but painted, absorbed only 2.0 horse-power. As stated, the efficiency of the open bladed impeller is very small compared to the shrouded impeller, and very large clearances will decrease this efficiency still farther. As an example: the side clearance of a four bladed open impeller (rough) was increased from ¼ to ½-inch. In the first case the resistance was 3.6 times that of a polished impeller, while in the second case it was 4.7. The above illustrates clearly the necessity of perfect castings, free from all blow holes and other imperfections; also the importance of small clearances and smooth and highly polished impellers and casings.

As will be seen later on, the use of shrouded impellers gives us a means of taking up the end thrust experienced in high lift pumps.

END THRUST.

Due to the side pressure on the impeller caused by the entering water striking it under pressure, there results an end thrust on the shaft of the pump which is not balanced by the water leaving the impeller at the periphery. In the single stage pump the thrust is very small and is taken up either by the use of a small thrust bearing on the end of the shaft or by the use of a twin volute casing. This design of casing permits the water being taken in at both sides of the impeller, thereby making the thrust on one side equal to the thrust on the other side. The twin volute is shown in Fig. 8.

The thrust bearing needs no explanation.

The end thrust in the series pump is taken up in four different ways: (a) by means of a thrust bearing; (b) by placing the impellers back to back, Fig. 9; this method requires the water to follow a most tortuous path from one stage to another and consequently is used in two tage pumps only; (c) by cutting a small hole in the impeller near the boss allowing the water to get on the back side of the impeller thereby equalizing the pressure, this can be

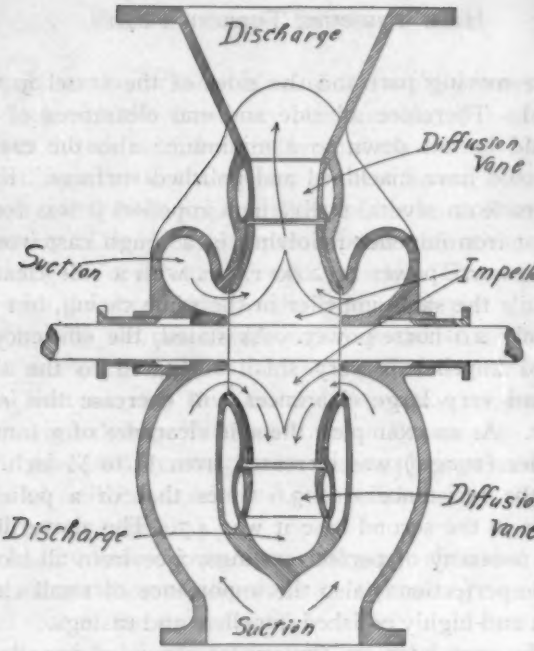

Discharge
Diffusion Vane
Suction
Impeller
Diffusion Vane
Discharge
Suction

FIG. 8.

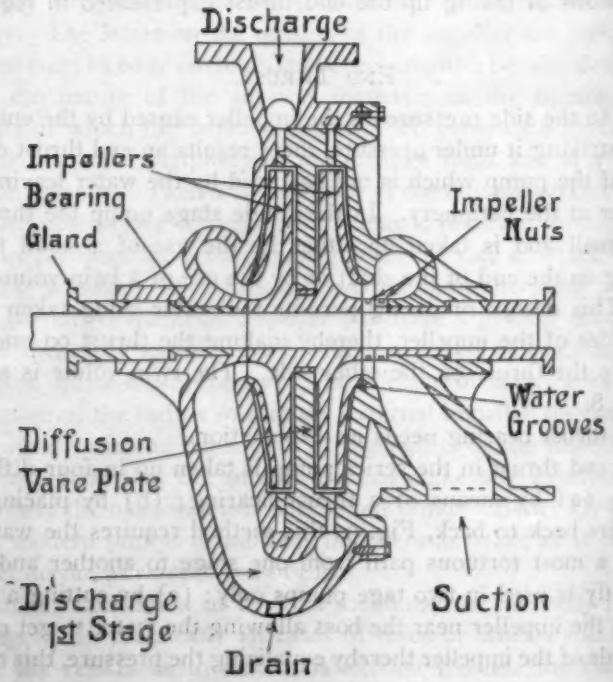

Discharge
Impellers
Bearing
Gland
Impeller Nuts
Water Grooves
Diffusion Vane Plate
Discharge 1st Stage
Drain
Suction

FIG. 9.

seen in Fig. 10 at A which shows the hole; (d) by placing a small balance disc on the last stage, this is much on the same order of the dummy piston used on steam turbines to take up the steam thrust, the area of the disc is so designed that the proper balancing presure will be exerted on the shaft. All series pumps are usually fitted with a small thrust block to prevent creeping of the shaft and to insure proper alignment between the fixed and the moving parts of the pump.

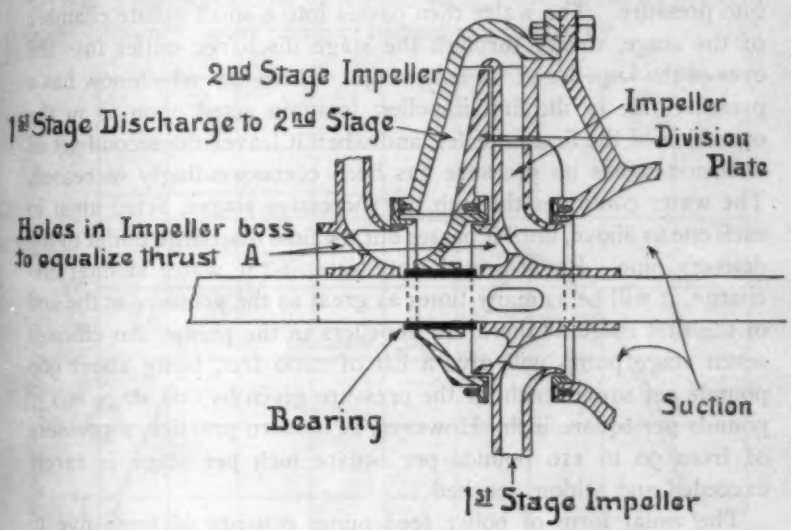


FIG. 10.

SHAFT PACKING AND LUBRICATION.

At each end of the shaft where it passes through the casing there is placed the ordinary type of stuffing box, the rubbing surface being lubricated by the water trickling through from the pump casing. The bearings of the pump are of the self oiling type or forced lubrication. The bearing of the division plates between the stages is of white metal, being a white metal collar around the shaft lubricated by water.

THE SERIES OR HIGH PRESSURE PUMP.

We now come to the high pressure or high lift pump, such as is used for fire pumps, boiler feed pumps, mine drainage pumps, and numerous other high lift duties. This pump consists of from two to 12 separate impellers, depending upon the lift, all inclosed

in one large casing but each impeller separated from the next by a division plate. The impellers and passages are so arranged that the water passes successively through them before it enters the discharge outlet. Briefly the action is as follows: water enters through the suction opening and enters the eyes or inlets of the first impeller where it comes in contact with the impeller blades. The blades impart velocity to the water, and the latter passing through the impeller outlets meets the diffusion vanes which vanes change the velocity into pressure. The water then passes into a small volute chamber of the stage, thence through the stage discharge outlet into the eyes of the impeller of the next stage. The water which now has a pressure due to the first impeller, is again acted upon as in the operation of the first impeller, and when it leaves the second set of diffusion vanes its pressure has been correspondingly increased. The water continues through the successive stages, acted upon in each one as above, until it passes out the final discharge outlet to the delivery pipe. Regarding the pressure of the water at final discharge, it will be as many times as great as the pressure at the end of the first stage as there are impellers in the pump. An efficient seven stage pump will give a lift of 2200 feet, being about 960 pounds per square inch, or the pressure given by one stage is 137 pounds per square inch. However, in modern practice, a pressure of from 90 to 110 pounds per square inch per stage is rarely exceeded and seldom reached.

The usual form of boiler feed pump consists of from five to six stages with a split casing, the pump shaft being connected to the motor shaft through a flexible coupling. The split casing allows the pump rotor to be taken out as a whole for cleaning or overhauling. This type is much simpler than the built up type in which the stages and their chambers are added on longitudinally, and the whole held together by through stay rods. The main joint against heavy pressure, in the split type, is a plain one, the two halves of the casing being held together by numerous heavy bolts equally spaced, and as the casing flanges are carefully machined the joint is a rigid one and easily kept tight. Fig. 10 shows the first two stages in part of a high pressure serits pump.

The curve in Fig. 11 shows the performance of one of these pumps driven at constant speed with varying quantity, the conditions under which a boiler feed pump on board ship would be working. The efficiency of this pump varies between 50 and 80

per cent, according to the design, a fair average would be 70 per cent; taking the efficiency of a motor driving the pump at a constant speed as 90 per cent, the combined efficiency will be 63 per cent, the 70 per cent being the manometer efficiency of the pump, *i. e.*, the ratio of the actual head delivered to the theoretical head. Under these conditions you will notice from the curve that while the quantity is varying from 60 per cent to 120 per cent of normal and the head about 15 per cent, the efficiency of the pump drops but 6 or 7 per cent below its normal value. The figure 63 per cent is the efficiency of the pump at normal rated capacity.

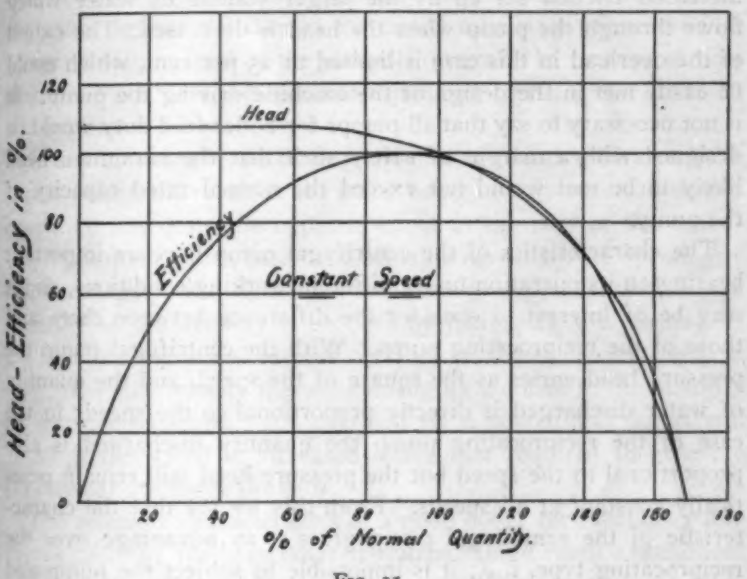


FIG. 11.

The efficiency curve coincides nearly with the head curve, the efficiency falling off as the head is decreased, but the head in a boiler feed is not likely to be changed much for the reason that the steam pressure in the boiler is practically a constant. There might be a slight increase in head due to the closing down of the check valves, but the efficiency in this case varies but little up to the rated capacity. If it should so happen, which is not likely to be the case, that all checks should be closed at the same time thereby increasing the head until the impeller churned water, the efficiency of the pump would reduce to zero, but the power required to drive

the pump would be only about 40 per cent of the power required at normal capacity.

As before stated the condition that would be met with aboard ship would be that of varying quantity. Consulting the curve again we see that the efficiency varies but little even down to 20 per cent of normal quantity delivered, and as the quantity delivered increases up to normal the efficiency increases.

There is a small increase in power required when the head against which the pump is working is decreased. This increase is due, to a great extent, to the drop in efficiency caused by the increased friction set up by the larger volume of water which flows through the pump when the head is decreased. The extent of the overload in this case is limited to 25 per cent, which could be easily met in the design of the machine driving the pump. It is not necessary to say that all pumps for boiler feed duty would be designed with a margin of safety such that the maximum head likely to be met would not exceed the normal rated capacity of the pump.

The characteristics of the centrifugal pump have an important bearing on its operation under different working conditions, and it may be of interest to consider the difference between them and those of the reciprocating pump. With the centrifugal pump the pressure head varies as the square of the speed, and the quantity of water discharged is directly proportional to the speed; in the case of the reciprocating pump the quantity discharged is also proportional to the speed but the pressure head will remain practically constant at all speeds. From this we see that the characteristic of the centrifugal pump gives it an advantage over the reciprocating type, *i. e.*, it is impossible to subject the pump and discharge pipe line to a higher pressure than that corresponding to the operating speed. For this reason it is possible to run the centrifugal pump at its normal rated speed with the discharge valve closed. It is a well known fact that when a centrifugal pump is running at constant speed and the head is gradually increased, a point is reached at which the pump ceases to deliver any water, because the head at this point will exactly balance the pressure delivered by the pump, and the impeller will simply churn the water in the casing. This would be the condition when the pump was running at normal speed with the discharge valve closed. This point can be made clearer by imagining a pump to

be discharging into a vertical standpipe of infinite length. As the pump is started and brought up to normal speed the water gradually rises in the pipe until it reaches the maximum head or height against which the pump is designed to deliver. The water now comes to a standstill and the impeller churns the water, but the energy generated by this churning will be sufficient to hold the water at the level at which it stopped. If the pipe could now be shortened below this level the flow of water through the pump would again start. So in the case of the closed discharge valve, if the valve is opened the head is lowered and the flow again set up. The surplus pressure generated in the pump always holds the water against the face of the closed valve at a pressure equal to the maximum head of the pump, if the pump be running at normal, or if not, at a pressure corresponding to the speed at which the impeller is turning.

It is a fact that while closing the discharge valve of a reciprocating pump will result in the pump being heavily overloaded, this operation has quite the opposite effect in the case of the centrifugal pump, in which case the load is increased by the opening of the discharge valve. This increase is due to the fact that when the pressure in the delivery is reduced by increasing the opening of the delivery valve the surplus pressure produced by the pump is converted into velocity thereby causing an increase in the quantity of water discharged. An overload on a centrifugal pump will result if the speed is increased above that required to generate the normal discharge pressure.

The requisite characteristics of a good boiler feed turbine pump are as follows: the horsepower required should reach a maximum at about the amount discharged corresponding to the maximum efficiency, which quantity would be that for which the pump is designed. After this point is passed the power taken becomes less as the flow increases, so that should the head on the pump be suddenly diminished, as through the breakage of the discharge line, or the sudden opening of a large number of checks at the same time, the horsepower consumed will actually decrease, thus rendering an overload in such a case impossible. This fact makes possible the use of smaller motors or turbines and permits the use of a motor or turbine which has the maximum efficiency at the output of the pump under normal working conditions.

As an example of an improperly designed pump: say at no delivery the pump generated a head of 200 pounds (delivery valve closed). When the valve is opened the head immediately rises until the pump is delivering 350 gallons per minute (normal), when the head is found to be 260 pounds. As the amount delivered increases the head falls. The greatest efficiency of the pump is obtained at 450 gallons per minute say; the head generated at this point would be about 235 pounds, which should therefore be the working head of the pump instead of 260 pounds which it generates at a normal discharge. The head at no delivery being 200 pounds the pump would not, when working against a static head as in a standpipe, begin to deliver until the speed has been considerably increased or a bypass opened. The power consumed by this pump would steadily increase from the point of no delivery up to the maximum quantity discharged. This means that if the discharge of the pump be suddenly opened, as when beginning to pump into an empty boiler, or when all the checks on the feed line are suddenly opened, the amount of power consumed would be excessive thereby causing a heavy overload; and the installation of a very large motor, in comparison with the power required, would be necessary.

A boiler feed pump should be capable of giving a steady, uninterrupted service with only very little attention. The simple reciprocating pump has fulfilled the above condition to a certain extent in spite of its very large steam consumption, its tendency to produce shock and vibration, its inadaptability for close regulation, and its numerous valves to care for.

The rotary feed pump is free from these defects and possesses several advantages besides: the supply of water can be regulated at the boiler independently of the pump; there is no danger of the breakage of the pump through loss of suction due to hot water; the pump contains no valves and has only two packings to be kept tight against water; there are no pistons, cylinder heads or packing rings to break on account of loss of suction and consequent racing and pounding.

Simplicity of construction and accessibility for inspection are essential for any pump that is to be installed for boiler feed purposes. The general type of the modern rotary pump casing is the split form as described in an early part of this paper. In this form the entire working parts of the pump are exposed on the

breaking of a single joint, and after removing the shaft bearing caps the entire impeller may be lifted out. Compare this with the case of the reciprocating pump with its numerous working parts and valves to be kept in order, both steam and water ends; also the number of joints to be broken in the case of the overhaul of the pump.

From an approximate computation, at maximum efficiency, of a well designed reciprocating pump and a turbine pump with induction motor, both pumps of the same capacity, the steam consumed per i.h.p. hour by the former was about 90 pounds, while in the case of the latter the consumption was only about 36 pounds, from half normal capacity up to full. This comparison shows a consumption of less than half the steam for the turbine pump. At lower loads than half the difference in favor of the turbine pump is not so marked yet it is still considerable.

SOME ADDITIONAL ADVANTAGES AND SUMMARY.

There are no sliding parts or wearing parts except the bearings of the shaft, thereby entailing practically no cost of upkeep.

There are no valves to keep tight as in the reciprocating pump.

Its freedom from breakdown due to its substantial and simple construction.

The water would be delivered to the boilers, or to the discharge pipe, in a steady stream without pulsation or shock, consequently there is no necessity for the air vessels now required for pumps of the reciprocating type. The above fact would be bound to relieve the whole system of piping with its joints of all such strains such as are now encountered with reciprocating motion pumps.

Should the boiler check valves be closed with the feed pumps running the pressure in the feed line would simply be raised to its designed maximum pressure, which is a small percentage above the boiler steam pressure. The feed lines would not have to be designed to withstand heavy pressures that might be brought on them, as is now the case with the reciprocating pump, but they could be designed for one set pressure and we would know that this pressure could never be exceeded for the reason that the pump would be incapable of delivering any pressure in excess under any conditions. With the reciprocating type of pump, it is well known that the strain on both pump and piping working under overload is likely to result in injury to one or both before the pump could be

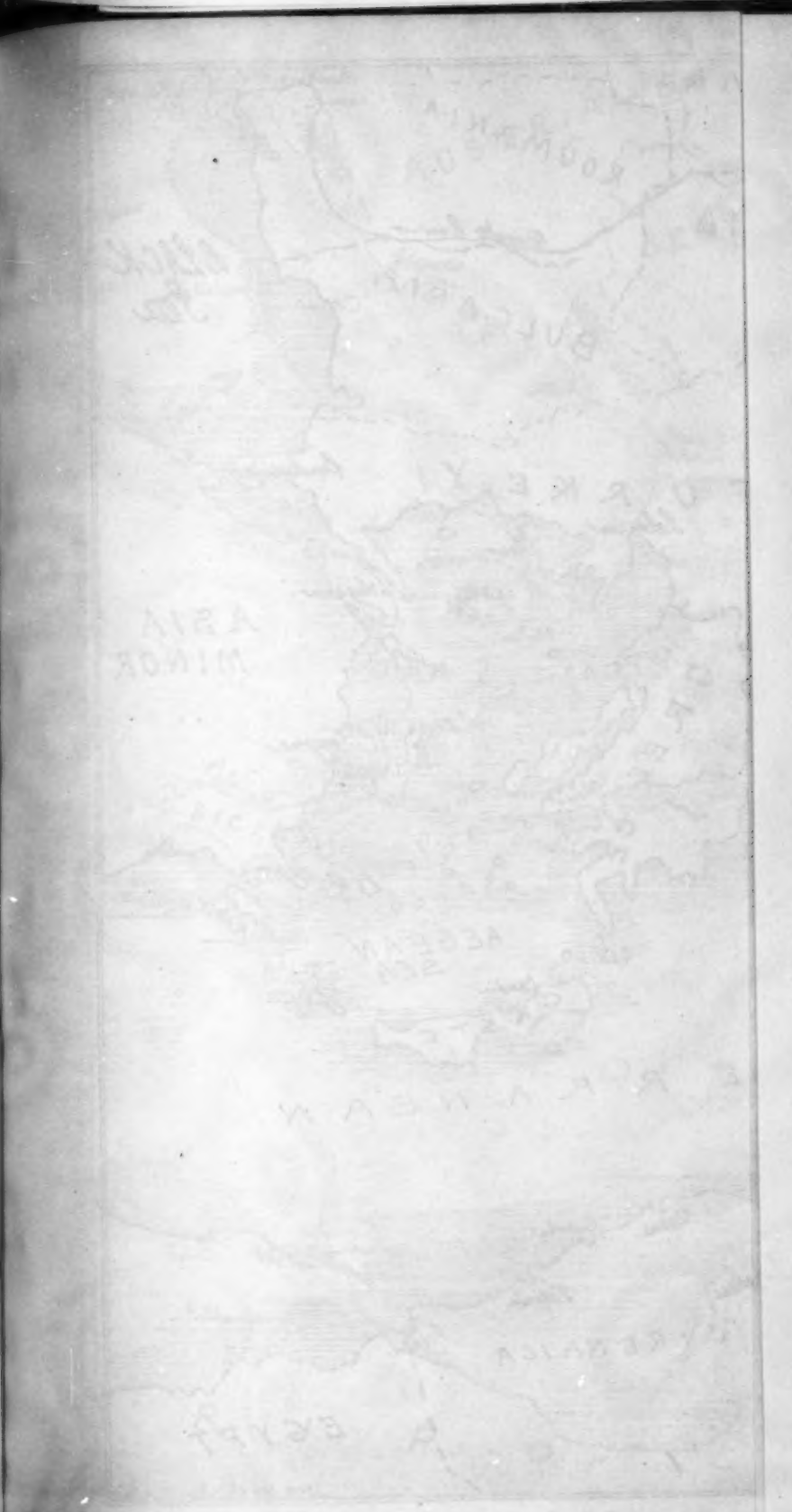
stopped, say for instance all the checks were suddenly closed with the pump running at full speed. Automatic devices to eliminate such an overload on the feed system have not proved altogether satisfactory.

There are no losses due to the starting and stopping of a piston, no loss of head due to water passing through the valve passages, no friction of stuffing boxes on a pump rod, no excessive leakage past a plunger or piston under heavy loads.

A large amount of worry and care removed from the senior engineer's shoulders on full power runs regarding the working of the feed pumps. On the beginning of the run all pumps would be started, and it would reduce to the simple question of the water tender manipulating his checks, no rings for more feed, no breaking down of the pumps due to excessive piston speeds required on all full power runs. The engine room force could hold no grievances against the deck force for shutting all the deck plugs without notifying the engine room that the services of the deck pump were no longer needed.

The price, weight, space occupied, reliability, are at present equal to the reciprocating pump, and further improvements now in progress will cause most of the above to be greatly in favor of the turbine or motor combination of the centrifugal pump.

When the simplicity of construction and the small cost of the centrifugal pump is taken into consideration, it seems rather remarkable that the use of it has been so limited. This is probably due to the impression which has held until recent years, that this pump was useless for other than low heads. Now that its satisfactory working at high heads has been demonstrated, there is every reason to suppose that it will soom come into use to perform the duties formerly allotted to the reciprocating type. The boiler feed turbine pump is being rapidly adopted by the large land power stations, and its operation has been found most satisfactory. Many water works are adopting it for feeding their pressure mains for the city supply as well as for supplying the pressure fire mains. Also the latest automobile fire engines have adopted the turbine pump using the gas engine as the motive power for driving it.



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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE ITALIAN-TURKISH WAR.

(CONTINUED.)

By COMMODORE W. H. BEEHLER, U. S. Navy (Retired).

(Compiled and translated from the *Marine Rundschau*, and other sources.)

EVENTS IN THE RED SEA AND VICINITY OF SUEZ CANAL.

For the protection of the Italian colony of Erythrea, the *Aretusa, Volturna* and *Staffeta* were cruising in the Red sea and, on October 2, 1911, engaged the Turkish destroyer *Prik-i-Schewket* which fled into the harbor of Hodeida, the Italians then engaging the ships and forts and withdrawing after sinking a custom house motor boat. The Italian garrison in Erythrea was reinforced from the 3700 Italian regulars to 10,000 men by recruiting natives. The cruiser *Puglia* landed 5 and 6-inch guns that were mounted on the works at Massowah.

September 30 the Turkish armored coast defence ship *Muin-i-Zafer* that had been stationed at Beirut arrived at Port Said and the Turkish transport *Kaiseri* with 700 Turkish troops came from Hodeida. Several days later a Russian transport also arrived from Hodeida with 800 Turkish troops. As the Turkish vessels did not leave within 24 hours the Italian and British consuls protested and the Turkish troops were landed and taken to the hospital because of the prevalence of cholera. The troops were subsequently sent via Kaleat and El Arich under Egyptian escort to Palestine.

The *Muin-i-Zafer* and an old Turkish gunboat that had arrived at Port Said were disarmed, their guns and ammunition being landed at Port Said.

THE CRUISER WAR.

As soon as war was declared both belligerents proceeded to seize unarmed vessels of the enemy. The Italians began by seizing two steamers carrying small detachments of Turkish troops

off the Albanian coast, and the Turks seized an Italian steamer in the Dardanelles loaded with grain and lumber. Subsequently, large vessels were not seized, and prizes were limited to smaller craft, fishing boats, sailing yachts, motorboats, etc., details of which were not published. In the Bay of Smyrna sixty-five small Italian vessels were seized before October 13.

The Hague Convention and London Conference on International Law were proclaimed by both belligerents to be respected, though neither had ratified the Hague Convention which had been signed by their representatives. The Turks were not even represented at the London Conference.

The Italian government proclaimed that contraband of war included guns and weapons of all description, ammunition and all material that may be used in war or be directly serviceable for the land and naval forces. The Turkish government issued a similar proclamation. To avoid conflict with Russia the Turkish government agreed to permit neutral vessels to pass through the Dardanelles from Black Sea ports, provided they did not take contraband of war and even permitted neutral ships to pass bound for Italian ports in case their cargoes were not consigned to the Italian government or to be of service for the military or naval forces of Italy.

Prize courts were established by both belligerents during October.

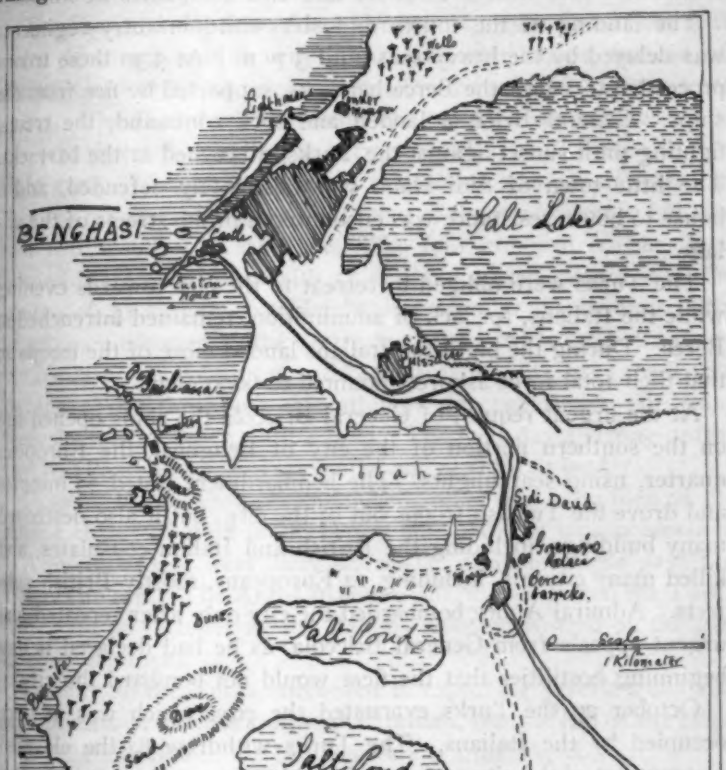
THE OCCUPATION OF BENGHASI.

The official report of Lieutenant-General Briccola gives the following details of the operations at Benghasi:

On October 18 a fleet of eight transports convoyed by the *Vittorrio Emanuele, Regina Elena, Roma, Napoli, Piemonte, Liguria* and *Etruria* with five destroyers and seven high-sea torpedo boats arrived off Benghasi with the staff and half of the Second Infantry Division. Admiral Aubry's demand for the surrender of the city was refused by Chakir Bey, who had a force of 400 regulars and 2500 irregular troops with two rapid fire batteries.

The Italians opened fire the next morning at a range of 1000 meters on the entrenchments at Berca to the southward, and on the lighthouse and magazine to the northward. At the same time, 8 a. m., the squadron landing force of 800 men and 4 guns disembarked, followed by the troops disembarking by means of the ships' boats, 13 pontoon floats and lighters from Tripoli.

The first sailor company landed at 8.50 on the Guiliana beach 2000 yards south of the city. One detachment went along the beach and occupied the Christian cemetery on a sand dune 10 meters high. Pioneers followed the first landing party and facilitated landing by five pontoon landing stages. Major-General Ameglio landed and took command. The Turkish troops stationed



MAP OF BENGHASI.

north of the city, to oppose landing there, rapidly reinforced those at Berca and vigorously attacked the center and right flank of the Italians. The ships bombarded the Turkish position, but the sailors in the cemetery were exposed to a heavy fire and also in danger of the shells from the fleet, so that they were obliged to temporarily abandon the cemetery. The torpedo boat *Orsa* with several armed ships' boats proceeded to the custom house wharf to see if

the Turkish troops had evacuated the city, but they were met with such a heavy fire from the troops concealed there that they withdrew. The fleet then directed a heavy fire on the custom house, which was completely demolished.

At 11.30 General Ameglio occupied the sand dunes back of Buscaiba Point with the sailors and two companies of infantry.

The landing of the fourth and sixty-third infantry regiments was delayed by the heavy seas until 3 p. m. At 3.30 these troops proceeded to attack the Berca barracks, supported by fire from the ships. General Briccola landed and took command, the troops fighting until sunset against the Turks intrenched at the barracks. The little town of Sidi Daub was obstinately defended, and a house to house resistance was encountered in the streets of the village.

The Turks were obliged to retreat to the city towards evening while the Italians, for lack of ammunition, remained intrenched at Berca. During the night the Italians landed more of the troops so that their total force ashore amounted to 6000 men.

At the urgent request of General Briccola the ships opened fire on the southern portion of the city of Benghasi, the European quarter, using searchlights. The bombardment lasted 20 minutes and drove the Turkish troops out of the city; but it also destroyed many buildings, including the British and Italian consulates, and killed many citizens, including 12 Europeans, mostly British subjects. Admiral Aubry bombarded the city only after repeated and urgent appeals from General Briccola, as he had declared before beginning hostilities that the fleet would not bombard the city.

October 29 the Turks evacuated the city, which was at once occupied by the Italians. The Turks withdrew to the elevated plateau east of the city and established headquarters at Bu Marian, about 20 miles from the coast.

The sailor landing parties re-embarked but left their guns ashore to reinforce the field artillery. The Italians reported a loss of 36 killed and 88 wounded, and estimated the Turkish loss at 200 killed and wounded.

A few days later the fourth infantry brigade at Benghasi was reinforced by the 68th regiment of the second brigade. The Arabs along the coast of Benghasi joined the Italians while the Arabs from the interior reinforced the Turkish troops.

Enver Bey, formerly military attaché at Berlin, commanded the Turkish forces. Frequent skirmishes followed but without decisive results. The Turks were usually repulsed by the shell fire from the ships.

THE OCCUPATION OF DERNA.

The *Pisa, Amalfi, San Marco, Napoli, Agordat* and *Coatit*, with three destroyers and several transports with troops, arrived off Derna, October 15, and negotiations for the surrender of the town failed. The *Pisa* then bombarded the town for 45 minutes. The fire was directed against the barracks and a small fort with two light guns. The fire was slow at rate of one shot per minute. As this was not answered a boat with flag of truce was sent in but was met with a volley of rifle fire. The four armored cruisers then opened fire on the town with 15 cm. and 19 cm guns and in the course of 30 minutes completely destroyed it. A landing party of 500 men escorted by the destroyers attempted to land at 2 p. m., but owing to the rough sea and heavy infantry fire from the Turks intrenched on the beach this attempt was repulsed. The ships then shelled the beach until 4 p. m. The next day a strong northeast wind and heavy seas prevented any attempt to land.

October 18 the Turks evacuated the place and 1500 men of the Alpine chasseurs with pioneers and field artillery took possession.

After this there were daily skirmishes and the Turks gave the Italians no rest. The Arabs from the interior reinforced the Turks daily, and on October 25 the Italians were reinforced by the 22d infantry regiment.

October 28 the Turks succeeded in capturing several guns and ammunition in an attack upon the Italians, but the fire of the ships drove them back and the Italians were not dislodged.

THE OCCUPATION OF HOMS.

October 16 the *Varese, Arpia* and four transports with the eighth Bersaglieri regiment having six field guns were sent from Tripoli to take possession of Homs. The Turkish commander refused to surrender and as heavy seas and bad weather prevented landing during the first three days the *Varese* and *Marco Polo* that arrived on the 17th, bombarded the castle and intrenchments on its flanks. The Italians estimate the Turks at 500 regular and 1000 irregular troops. The weather moderated on October 21

and the Italians landed after overcoming a stubborn resistance. Two Italian boats capsized. The Turks subsequently frequently attacked the Italians but were, as usual, repulsed by fire from the ships.

THE ITALIAN MILITARY POSITION AT TRIPOLI IN OCTOBER, 1911.

The first corps of the Italians were intrenched around the city of Tripoli from Fort Gagaresch 2 kilometers west of the city to Scharaschat 3 kilometers east. The right flank extended from Gagaresch to Bu Meliana and was held by the 63d regiment. The 82d and 80th regiments held the center from Bu Meliana to the village Henni, they occupied the cavalry barracks and Fort Mesri. The 11th Bersaglieri regiment occupied the left flank from Henni to Scharaschat. Serving as reserves, in rear, at the extreme flanks, the naval landing brigades from the training ships squadron and a part of the 4th infantry were stationed.

The desert afforded unobstructed view of the approaches on the right flank so that the Turks were there exposed to the gun fire from the ships. The center was opposite the edge of the oasis and the left flank faced the oasis where elevations, trees, garden walls and buildings obstructed the view of the country beyond.

It was difficult to reconnoitre this country and the Italians used aeroplanes, three aeroplanes at Benghasi and six at Tripoli. The first aeroplane was used on November 1, from which hand grenades were thrown upon the Turkish camp at Ain Zara.

The Italians used a hand grenade invented by Lieutenant Cipelli of the navy, who was killed by an explosion of one of these grenades. These Cipelli grenades are made at Spezia. They are formed of a steel shell, about the size of an orange, filled with picrate acid. A cap is inserted just before the grenade is to be used. It is exploded by a steel ball that is withheld in position by means of a safety pin that is removed immediately before the hand grenade is thrown. The steel ball is held in place after the removal of the saftey pin by pressure of the hand. In case the aviator is alone in his flight it is necessary for him to use one hand on the steering gear while he holds the grenade between his knees to remove the safety pin with the other hand. The use of the aeroplanes at Tripoli was much limited by the winds and dust from the sandy desert.

The Italians suffered for lack of water as the available wells were not sufficient to supply them with water. Naval water-boats were in constant service transporting water from Sicily to Tripoli.

Cholera prevailed and the Italian army suffered a loss of 25 to 30 men daily who died from cholera. The mortality among the civilians in Tripoli was much greater.

THE TURKISH POSITION AROUND TRIPOLI.

The Turkish garrison of 2870 men withdrew to Ain Zara about five miles south of Tripoli with their main body at Zanzur, 12 miles southwest of the city. Their outposts were close to the Italian lines. By strenuous work the Turkish commander, Colonel Neschat Bey, organized an effective force which he recruited from the natives by volunteers to 20,000 men by November 1, and which was being daily reinforced. These volunteers were good riflemen and marksmen but undisciplined. The chief bases for recruits were at Aziziah, Kasr Gharian, and Kasr Veffren, from 40 to 75 miles south of Tripoli.

ENGAGEMENTS AT TRIPOLI DURING NOVEMBER, 1911.

A series of attacks on the Italians were made in force by the Turks with 6000 men on October 23-26, chiefly against the Italian center and left flank. These attacks ware supported by a revolt of the people in the city that was suppressed with great loss by the 11th Bersaglieri regiment. The *Sicilia* and *Sardegna* participated in the defence of positions on the left flank by shelling the Turks. The Turks were finally repulsed but they gained position by capturing Bu Meliana, Henni and Fort Mesri with several field guns, machine guns and other war material, together with about 100 prisoners.

The Italians were obliged to take up a new position that extended from the right flank to Feschlum and Schara Zaniet. The Turks took possession of the forts around the city and, on October 31, they began to bombard the city from Fort Hamidje. They were soon silenced by the gun fire of the *Carlo Alberto* and *Lampo*.

In the battles of October 23 and 26 the Italians lost 382 killed and 158 wounded. The Italians estimated the Turks lost 1000.

The civilians who participated in the revolt were arrested and about 100 were convicted and shot. It was reported that a much

larger number of civilians were executed, some stating over 400, but this has not been verified and was denied by the Italian government. It was reported that some of the irregular Arab troops, who had expended their ammunition and surrendered, were shot. In consequence of these reports the Turkish government protested against the inhumanity of the Italians to the Hague court. The Italians claim that the native population were only treated as absolutely necessary for self defence. General Caneva then sent 3000 of the citizens as prisoners of war to Gaeta and the Islands of Ustica and Tremiti. He also compulsorily disarmed all the natives.

The Italians were reinforced by fresh troops from Italy to the number of 30,000 men by November 7, after which they began to retake the positions formerly occupied. The fifth brigade of infantry that had just arrived recaptured Fort Hamidje with difficulty. The training ship division shelled Fort A-Sultanje, and C-Fort Gargaresch. Two battalions made a reconnoissance in force towards Ain Zara and Zansur.

The Turks made a series of attacks after November 9, but were repulsed by shell fire from the ships *Liguria, Carlo Alberto, Partenope* and *Cigno*. The hotly contested entrenchments at Bu Meliana were recaptured but had to be abandoned again because the heavy rains had flooded the neighborhood. In the confusion of the flood the Turks made a vigorous attack on November 17 and captured several Italian guns. The rainy season deferred extensive invasion into the interior.

November 5, 1911, the King of Italy proclaimed the annexation of Tripoli and Cyrenaica as under the complete sovereignty of the Kingdom of Italy.

REINFORCEMENTS FOR THE ITALIAN TROOPS.

A second expedition corps was formed and transported in detachments to Tripoli and Cyrenaica during the early part of November. The organizations were as follows:

THIRD INFANTRY DIVISION, LIEUT.-GENERAL DE CHAURAND.

5th Brigade.	*6th Brigade.*
18th regiment infantry.	52d regiment infantry.
93d regiment infantry.	23d regiment infantry.

1 regiment field artillery, 6 batteries.
3 squadrons cavalry.

FOURTH INFANTRY DIVISION, LIEUT.-GENERAL COUNT TROMBI.

7th Brigade.	*8th Brigade.*
20th regiment infantry.	37th regiment infantry.
79th regiment infantry.	50th regiment infantry.

1 regiment field artillery, 6 batteries.
3 squadrons cavalry.

By November 20, 1911, Italy had sent the following:

16 regiments of infantry	48,000
3 regiments Bersaglieri	9,000
3 battalions Grenadiers	3,000
4 battalions Alpine Chasseurs	4,000
4 regiments combination field artillery	6,000
3 battalions pioneers	3,000
2 battalions engineers	1,000
12 squadrons cavalry	2,400
3 squadrons Carabineers	600
6 detachments gensdarmes service	1,000
Train	7,000
	85,000

Exclusive of a detachment of special troops.

The troops sent to Italy included some of the men on reserve lists and were not exclusively those belonging to the active army. Additional reserves were called out to replace these men to number about 90,000 additional reserves.

As there was a lack of officers trained as aviators, ten civilian aviators volunteered with a corps of artificer mechanics and 60 engineer soldiers. One half of these were sent to Derna and Tobruk and the others to Tripoli.

THE ACTIVITY OF THE ITALIAN NAVY.

The co-operation of the navy, after the landing of the first expedition corps, was to accomplish the following objects:

1. Support of the land forces in engagements on shore was assigned to the *Sicilia, Carlo Alberto, Sardegna* and *Marco Polo* off Tripoli and Homs.

2. The blockade of the Tripolitan coast that was first conducted by the cruisers and torpedo vessels was assigned after November 10 to the four new Italian mail steamers that formerly plied between Naples and Palermo and which were each armed with six-inch guns.

3. The Turkish coasts of Albania, Syria and the Aegean sea were reconnoitered by a division of four destroyers in each region.

4. The passages between Crete and the mainland were guarded by several ships and destroyers of the Duke of Abruzzia's command. As the transports conveying troops were constantly going to and from Tripoli and Italy without convoy it was necessary to guard these passages strictly.

Early in November several cruisers and torpedo boats bombarded the small Tripolitan coast ports at Suara and Adjita near the Tunisian frontier in order to destroy the contraband stores that had been collected there from across the Tunisian border.

The ships of the first two squadrons left October 24 for Augusta, Tarento and Naples to replenish stores and fuel, and prepare for a new series of operations that were rumored to be contemplated against the Turkish forces in the Aegean sea.

Tobruk was established as a naval base and some of the fleet replenished stores and fuel there.

The Turkish squadron remained off Constantinople and rarely left the Dardanelles. In expectation of an attack by the Italian fleet, the Turkish troops on all the islands of the Aegean sea were reinforced, especially at Lemnos, Mythelene, Chios and Rhodes. The defences at the Dardanelles were strengthened and 5000 additional troops were sent there to reinforce the garrison. These rumors caused a large emigration of the inhabitants from the islands of the Aegean sea.

The defences of the Dardanelles that consisted of three forts at the western entrance with 20 heavy guns and 80 heavy guns in the forts at the narrow strait between Chanak and Nagara were strengthened with 120 additional guns but chiefly of smaller caliber. These forts were garrisoned by 7000 men and all the villages and buildings around these forts that might obstruct the fire of the guns were razed. The old mine fields forming three barriers at Kum Kale, Chanak and Nagara were reinforced by two additional mine fields with Whitehead mines of the latest construction at Kephes. The old mines were not reliable, they had been neglected and in that channel with depths ranging from 8 to 20 fathoms there is a strong current that often has a maximum strength of five miles per hour. Twelve old hulks were provided and made ready to be sunk in the narrowest part of the strait, that is at Chanak, where it is 1300 meters in width. The entire Turkish fleet was also pre-

pared to defend the passage through the Dardanelles. Admiral Fisher stated that in view of the topography and conditions in the straits of Dardanelles they could not be taken or forced unless the attacking fleet could afford to sacrifice twenty obsolete battleships and force the passage with the rest of the fleet, which should be of the most modern type.

At Gallipolis 25,000 Turks were stationed to defend any attempt to land there.

The heavily armed forts at Cape Karaburun and the Nasiki peninsula were strengthened and several batteries of rapid fire guns were mounted there to defend the approaches to Salonica, a city of 120,000 inhabitants. The entrance to the bay, two miles wide, was mined. The channels leading into Smyrna were defended by two forts at Sanjak Kalessi, 6 miles from Smyrna, which is a city of 300,000 inhabitants. These were strengthened and a new earthwork fort was constructed with twelve 15 cm. guns with several rapid fire batteries. 20,000 Turks were ready to prevent any landing.

At Mythelene the garrison was reinforced by 2000 troops. All the other important islands were likewise reinforced; Lemnos, Rhodes, Samos and Chios each receiving 1500 additional troops with artillery.

The Turkish government issued rifles to all Mohammedans in the islands of Aegean sea, and ordered all Italians that resided in the region around the Dardanelles to leave, and, in the course of November, transported many to other parts of the country.

Any attack by Italy on the Turks in Europe or Asia Minor would involve international complications as all powers have possessions there, and, besides, the great strength of the highly trained Turkish army would render such an attempt hopeless.

The Italian government, however, notified the Austrian and Russian governments of intention to blockade the straits of Dardanelles on November 20, 1911. The Russian government answered in a note, on November 24, that the neutrality of the Dardanelles must be respected; and based this claim on the Pontus treaty of 1871 which was further strengthened by the protocol of the Declaration of London of 1909, that stipulated that the approaches to neutral ports shall not be blockaded. The Declaration of London was not ratified by the powers. Russia also protested against the Turkish contemplated design of placing barriers in the straits of Dardanelles.

On November 27 Italy replied that she did not intend to blockade the Dardanelles, but, nevertheless, the Turks continued to strengthen its defences.

The Austrian and Russian ambassadors endeavored to mediate to secure peace, to which Turkey replied that she had no objection to concluding an honorable peace, but the loss of the two African provinces could not be permitted by the Young Turk government without endangering the country's constitution.

ITALIAN NAVAL OPERATIONS DURING DECEMBER, 1911.

The second squadron remained in South Italian ports while the vessels of the first squadron were distributed among the ports of Cyrenaica, and seldom visited the home ports. During the first part of December the *Roma, Regina-Elena, San Marco* and *Agordat* were at Benghasi; the *Napoli* at Derna; the *Vittorio-Emanuele, Pisa, Etna* and *Etruria* at Tobruk, with 12 torpedo vessels and the *Vulcano;* the *Marco Polo* at Homs, and the training ship squadron at Tripoli. These vessels co-operated in all the engagements with the army on shore, by landing parties, their naval guns and by bombarding the Turkish forces whenever within range of the guns of ships. The two old battleships *Italia* and *Lepanto* were prepared as station ships to relieve the training ship squadron. The Italians had a large supply of ammunition for the 43 cm. (16.8-inch) guns of these ships.

The *Vettor Pisani,* the Duke of Abruzzia's flagship, remained at Tarento and Brindisi until the middle of December. Some destroyers and high sea torpedo boats of this division cruised singly along the Albanian and Grecian coasts, in the Ionian sea, the Aegean sea and along the coast of Asia Minor.

The *Liguria, Partenope, Dardo* and *Euro* co-operated in attacking Zuara, Misrata and Argub near the Tunisian frontier.

December 15 the first division arrived at Tarento and the training ship division at Spezia. All ships were revictualed and the flag officers went to Rome for a council of war.

The navy was active in the Red sea where the squadron was reinforced by the *Calabria* returning from the Asiatic station. It was reported that 20,000 Arabs were organized in Arabia to attack the Italian colony at Erythrea, and to reinforce the Turks in Cyrenaica.

The Italian cruisers searched all the Arabian Red sea ports for Turkish vessels and troops. November 19 the *Puglia* and *Calabria* destroyed the port of Akaba, a place of 500 inhabitants, where Turkish troops had assembled. During the passage of the British king and queen through the Red sea en route returning from the coronation ceremonies in India, all hostilities were suspended until after November 26. November 30 the *Calabria* and *Volturno* bombarded the quarantine station Sheik Said near Perim and Mocca 40 miles north of Perim, where 5000 Turks with field artillery were preparing to cross the Red sea and attack Erythrea. They sank all their sailing craft, including a large number of dhows.

After clearing the Red sea of the Turks, the Italians re-established the lights on the coast of Erythrea.

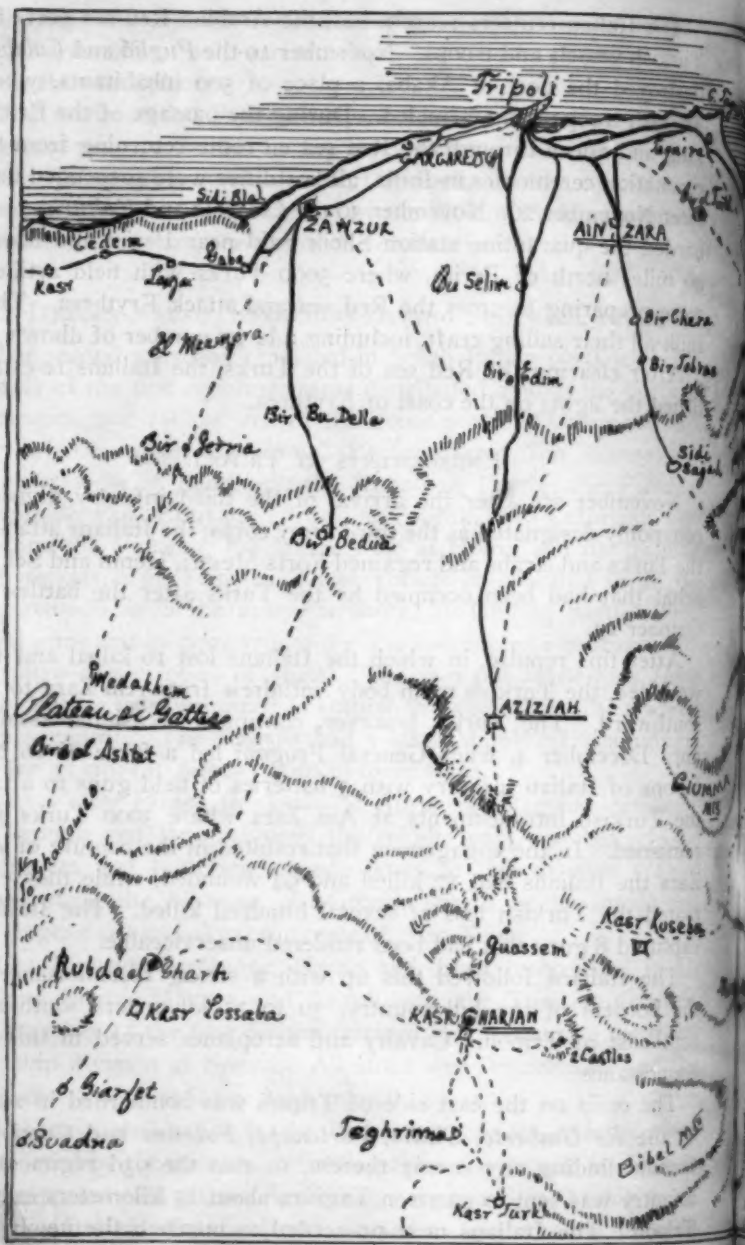
ENGAGEMENTS AT TRIPOLI.

November 26, after the arrival of the third infantry division, commonly designated as the third army corps, the Italians attacked the Turks and Arabs and regained Forts Messri, Henni and Scharachat that had been occupied by the Turks after the battles on October 23.

After this repulse, in which the Italians lost 16 killed and 104 wounded, the Turkish main body withdrew from Ain Zara to the southward. The Turks, however, continued occasional assaults until December 4, when General Frugoni led a force of 16 battalions of Italian infantry with 5 batteries of field guns to attack the Turkish intrenchments at Ain Zara where 3000 Turks still remained. In the engagement that resulted in the capture of Ain Zara the Italians had 17 killed and 94 wounded, while they estimated the Turkish loss at several hundred killed. The Italians captured 8 guns that had been rendered unserviceable.

The Italians followed this up with a strong reconnoisance to the borders of the hill country, 30 to 35 kilometers south and southeast of Tripoli. Cavalry and aeroplanes served in this reconnoisance.

The oasis on the east side of Tripoli was bombarded in zones by the *Re Umberto, Sicilia, Partenope, Fulmine* and *Cassiopea* without finding any enemy therein, so that the 93d regiment of infantry was sent to garrison Tagiura about 15 kilometers east of Tripoli. The Italians next proceeded to intrench the newly acquired positions. A battery of 14.9 cm. guns and a 21 cm. rifled


Tripoli
Sidi Bilal
ZANZUR
AIN ZARA
Cedeim
Kasr
Lanja
Bu Selim
Bir Chera
Bir Tobras
Bir Bu Della
Bir Bedina
Sidi Sagel
Medakhem
Plateau di Gattie
AZIZIAH
Bir el Ashtat
Rhadames
Kasr Kuseba
Guassem
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Kasr Lossaba
KASR GHARIAN
2 Castles
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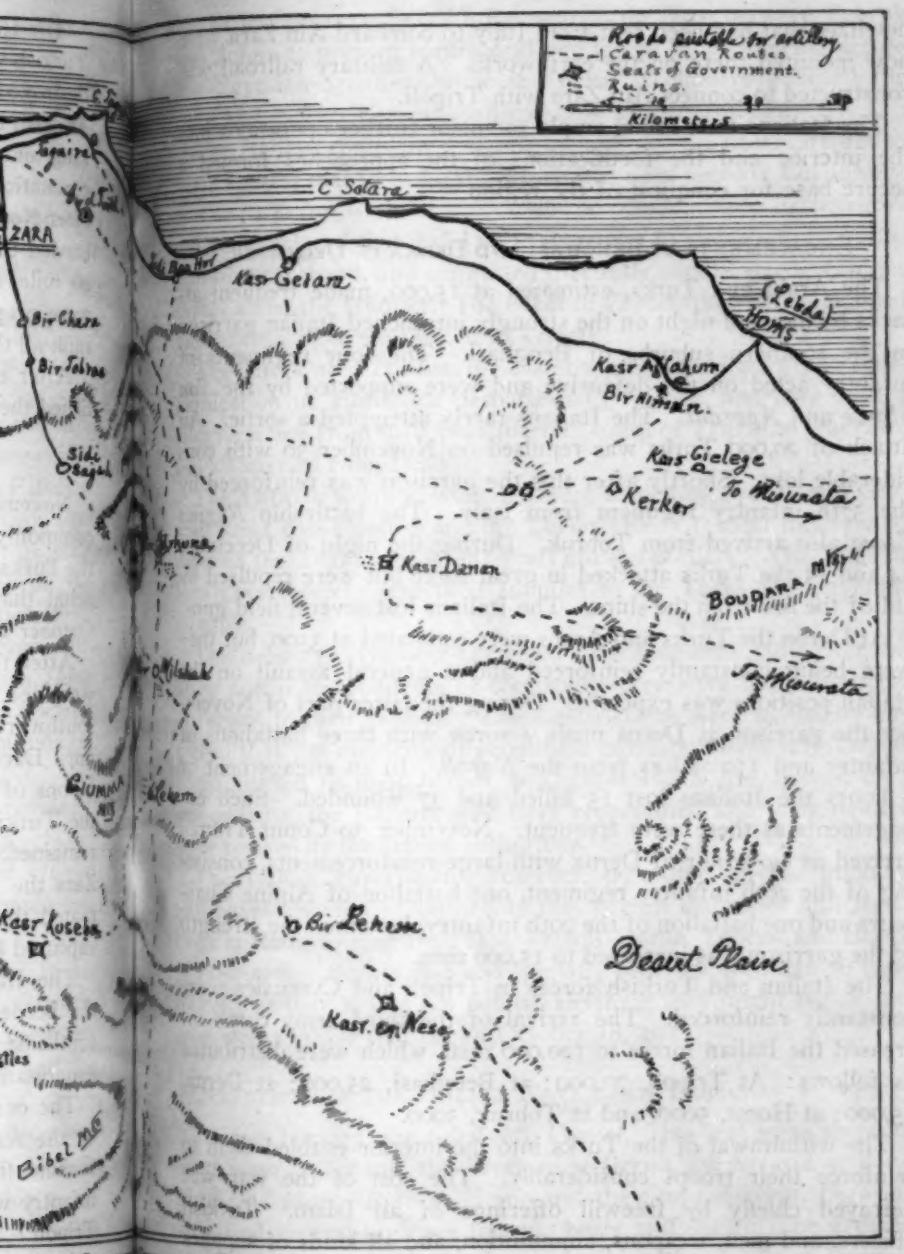


THE SURROUNDING COUNTRY AT TRIPOLI.

howitzer that had been sent from Italy to bombard Ain Zara were now mounted there on the earthworks. A military railroad was constructed to connect Ain Zara with Tripoli.

The Italians thus found ample room for further operations into the interior and the fortifications of the approaches formed a secure base for conquest of the region.

ENGAGEMENTS AT BENGHASI AND DERNA IN DECEMBER.

The Arabs and Turks, estimated at 15,000, made frequent attacks by day and night on the strongly intrenched Italian garrison in the southern suburbs of Benghasi. The four regiments of infantry acted on the defensive and were supported by the *San Marco* and *Agordat*. The Italians rarely attempted a sortie. An attack of 20,000 Turks was repulsed on November 30 with considerable loss. Shortly after this the garrison was reinforced by the 57th infantry regiment from Italy. The battleship *Regina Elena* also arrived from Tobruk. During the night of December 14 and 15 the Turks attacked in great force but were repulsed by aid of the fire from the ships. The Italians lost several field guns.

At Derna the Turks and Arabs were estimated at 3500, but they were being constantly reinforced and a general assault on the Italian positions was expected. During the latter part of November the garrison at Derna made a sortie with three battalions of infantry and 150 sailors from the *Napoli*. In an engagement of 8 hours the Italians lost 15 killed and 37 wounded. Such engagements as these were frequent. November 30 Count Trombi arrived as Governor of Derna with large reinforcements, consisting of the 26th infantry regiment, one battalion of Alpine Chasseurs and one battalion of the 20th infantry, by which the strength of the garrison was increased to 15,000 men.

The Italian and Turkish forces in Tripoli and Cyrenaica were constantly reinforced. The arrival of the third army corps increased the Italian forces to 120,000 men, which were distributed as follows: At Tripoli, 70,000; at Benghasi, 25,000; at Derna, 15,000; at Homs, 5000, and at Tobruk, 5000.

The withdrawal of the Turks into the interior enabled them to reinforce their troops considerably. The cost of the war was defrayed chiefly by freewill offerings of all Islam. Turkish officers, and men, weapons, ammunition, and all kinds of supplies were constantly sent across the Egyptian and Tunisian frontiers, notwithstanding their neutrality.

The Italians occupied Sidi Barrami on the coast between Tobruk and Solum to prevent contraband and troops from entering across the Egyptian frontier, while the naval blockaders guarded the coast and captured several sailing ships with contraband.

The Italians complained of this violation of the neutrality not so much against that from Egypt, which was done secretly, but against that from Tunis, where it was carried on openly. The French government declared that it did all in its power to stop the transportation of contraband, and suggested that Italy should strengthen her forces along the frontier. The effect of French prohibition stopped the caravan trade via Delibat to Tripoli.

The Turks used Delibat, the eastern terminus of telegraph communication in Tunis, for despatches to Europe, and they built a telegraph line from their headquarters south of Tripoli to Quezzan, five kilometers from Delibat.

The Turkish sick and wounded were tended by French and German Red Cross societies and the Turkish Red Crescent society who reached the Turks and Arabs via Tunisian borders. The English Red Cross society sent their supplies to the Turks via Egyptian frontier.

The Italian government exercised a rigorous censorship over the press and correspondents of the newspapers were limited strictly in regard to their reports. These restrictions were so strictly enforced that the majority of prominent correspondents left Tripoli and returned to their homes, and, excepting a few French correspondents, the Italians only were represented and their reports were revised by the Italian authorities.

The Italian government, however, permitted all the military and naval attachés accredited to the foreign embassies and legations at Rome to visit Benghasi, Tripoli, Derna, Tobruk and Homs in the steamer *Bosnia* that was specially provided for them on condition that they would not publish anything they might see on the four weeks cruise that began October 18, 1911.

OPERATIONS OF THE ITALIAN NAVY UNTIL FEBRUARY 20, 1912

During January, the *Garibaldi, Varese, Etna* and some torpedo boats were at Tobruk, the *Ferrucio* at *Derna*, the *Etruria* at Benghasi, the *Marco Polo* at Homs and the *Carlo Alberto, Liguria, Iride* and several high sea torpedo boats at Tripoli. The greater part of the fleet that returned to Italy about the middle of December remained in Italy refitting, etc.

As the Italian patrol of the Turkish European coasts had been to a great extent withdrawn, and as it was evidently not intended to attack such ports, the Turkish government discharged the reserves in the garrisons of the islands and some of those on the mainland.

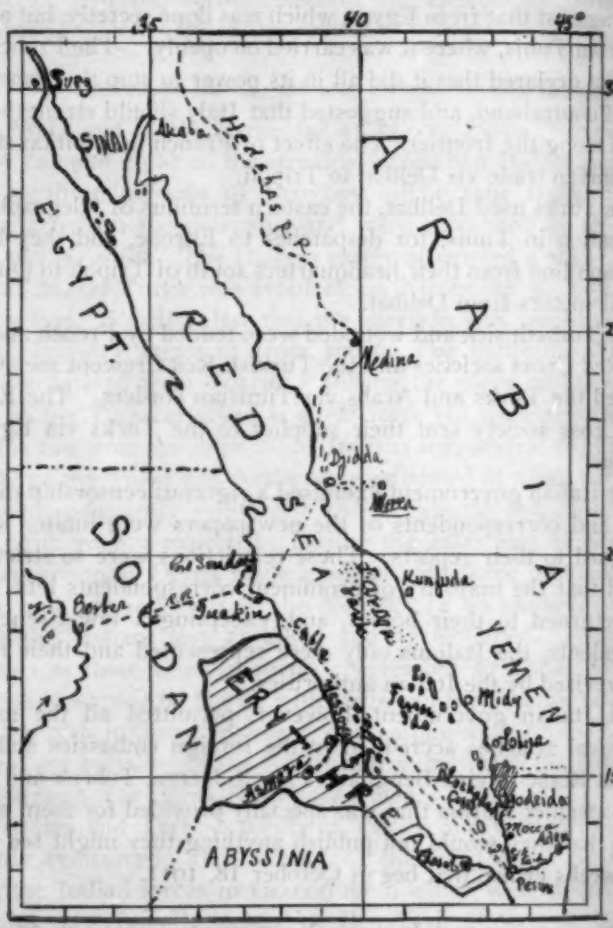


CHART OF RED SEA.

In the Red sea a threatened attack on the colony of Erythrea caused the Italians to reinforce the naval forces there so that they had there the *Piemonte, Calabria, Puglia, Aretusa, Volturno,* and *Staffeta,* with the four large destroyers *Artigliere, Granatiere, Bersagliere* and *Garabaldino.*

The Italian naval commander ascertained that seven small Turkish gunboats that had been in the Persian gulf were concealed near the Farsan Islands and the above named ships searched for them. These vessels had been ordered home, but ran out of coal and were unable to proceed: as the Turkish transport *Kaiseri* which had coal for these gunboats had been captured by the Italians. The Italians were ignorant that the lack of coal had prevented these gunboats from reaching Suez, and believed that they had entered the Red sea to transport Arabs to reinforce the Turks or to attack Erythrea.

January 7 the Italians discovered the seven gunboats with the steam yacht *Fuad,* at anchor at Kunfuda. The Italian ships opened fire on the gunboats and after three hours' firing at 4500 meters they sank all except three that were beached. The crews deserted the beached gunboats and the Italians completed their total destruction the next morning, getting some light guns and a few trophies from the little squadron. The Italians bombarded Kunfuda and captured four Arab sailing vessels and the yacht *Fuad,* which they towed to Massowah. They bombarded small Arabian Red sea ports; Akaba (for the third time on January 19), *Djebana, Sheik Said, Mocca* and *Midy.* The auxiliary cruiser *Citta di Palermo* bombarded a camp on the Sinai peninsula, but these bombardments caused very little damage to the Arabs, as *most of the shells failed to explode.*

The Italians thereupon declared the coast blockaded for a distance of 45 miles around Hodeida in the Red Sea, a seaport of 45,000 inhabitants.

This blockade became effective January 26, 1912. It was caused by the transportation of Turkish troops, money and supplies in neutral vessels to Hodeida. The Egyptian mail steamer *Menzaleh* was seized with 750,000 francs on board consigned to Turkish officials. The *Volturno* found 20 Turkish officers on board the British steamer *Africa* and the Austrian Lloyd steamer *Bregenz.* The blockade of Hodeida was assigned chiefly to the two large armed fast mail steamers *Duca degli Abruzzi* and *Duca di Genova* that had been sent from Italy with the cruisers *Liguria* and *Elba.*

In the bombardment of Djebana the *Piemonte* damaged the railroad building by the French there and the railroad company sued the Italian government for 200,000 lires for the damage to French property. The Italians took off about 100 British and some French residents of Hodeida.

Early in February the Italians supported the Arabian leader of the insurrection against the Turks, Said Idris, 200 of whose followers took possession of Farsan Island, while these insurgents put the Turkish forces of Yemen on the defensive and greatly relieved the Italians.

OPERATIONS AT TRIPOLI IN JANUARY.

The Italians were frequently attacked at Ain Zara by the Turks who established their active headquarters at Aziziah with their main body at Gharian. The Italians made repeated attempts during January and early in February to capture Zanzur but failed with heavy losses. The failure of an attack with four battalions of infantry, on December 17, caused the relief of Lieut.-General Pecori-Giraldi by Lieut.-General Camerana. The Turkish commander who defeated the Italians was Colonel Fara, who was promoted to Major-General for his victory. Details of this action were suppressed, but the Italians lost 50 killed and over 100 wounded.

The Turks surrounded Tripoli exterior to the circumference of a circle with a radius of 15 to 20 kilometers extending from near the village of Gargaresch around near Ain Zara to Bir-el-Turki east of Ain Zara. The natives of Gargaresch affiliated with the Italians and the Turks captured the town in order to punish the people for sympathizing with the Italians. On January 18 the Turks repulsed an attack by four battalions of infantry to recapture the place. The Italians were repulsed and only succeeded in taking the place after a desperate fight two days later. The Turks then withdrew but repeatedly renewed attacks on the Italians there. The Turks repeatedly attacked Ain Zara, but on February 5 they were driven out of their positions between Ain Zara and Gargaresch by long continued bombardment with 6-inch siege guns. An attack on Zanzur on February 22 with four battalions of infantry and three field batteries was repulsed by the Turks.

At Homs the Italians were obliged to remain close to the town. The Turks attacked repeatedly but were always repulsed by shells from the *Marco Polo*.

Zuara, 105 kilometers west of Tripoli, was a junction of the trade route between Tunis and Gharian. It was frequently bombarded by the Italian ships, but landing detachments were obliged to re-embark by the Turks.

The occupation of the town was decided upon just before Christmas when the *Pisa* convoyed four transports with the 10th infantry brigade to Zuara. Bad weather prevented landing, and after waiting several days the expedition returned to Augusta. The shells from the ships destroyed several buildings in the town but the energetic Turkish commander repulsed all attempts to land. The Italians finally abandoned the idea of landing as it would require greater sacrifices than the possession of the place warranted.

In Cyrenaica the Italians extended their occupation during January and February at Benghasi for a distance of 7 kilometers from the city and likewise at Derna and Tobruk. Strong fortifications were constructed, and heavy 6-inch siege guns were mounted on the works. At Benghasi the works were connected by a military field railroad ten kilometers long. At all these places the Italians acted on the defensive and repulsed the constant attacks by the Turks by aid of shell fire from ships, as these defenses were well within range of the guns of the ships in the harbors.

Invasion into the interior was not attempted and efforts were chiefly directed to strengthen the defences of a limited region along the coast and along the captured seaports. The Italians planned to prolong the war, and in the course of time by conciliatory conduct towards the Arabs to win them over and persuade them to accept the Italian conquest.

AVIATION.

The military aviators rendered good service as scouts. Lieutenant Rossi, of the Italian navy, made 60 flights at Tobruk and he recommended that the use of the Cipelli hand grenades should be discontinued because they are too difficult for a single aviator and very dangerous, besides which they rarely hit, and seldom exploded in the soft sand of the desert. Most all of the aeroplanes used by the Italians carry the aviator only. These aviators are obliged to ascend to heights of 1000 meters or more over the enemy's position that the aeroplane may not be hit by rifle bullets, notwithstanding the lack of proper aiming apparatus. In a flight at Tobruk, Rossi took Captain Montu as a passenger on February 1, and when at a height of 600 meters, the aeroplane was hit five times by rifle bullets and Captain Montu, himself, was hit and slightly wounded.

The Italian military aeroplanes carry the aviator only and are of the types of Bleriot, Nieuport, Etrich and Farman, with 50 horse-power motors. They cost about $6000 each, and will serve for about six months. It is contemplated to procure larger aeroplanes of 70 to 100 horse-power and capable of carrying several passengers. Upon arrival at the theater of the war they will experiment with various types of hand grenades. The Italian aviators instead of throwing hand grenades substituted Arab script calling upon the Arabs to surrender.

Captain Moizo made a flight to scout from Tripoli to Gharian, 85 kilometers south of Tripoli, and return, and on February 12 he made a flight from Tripoli to Homs and return, a distance of 240 kilometers, 150 miles.

CONTRABAND OF WAR TRANSPORTATION.

Solum, on the coast of the Egyptian-Tripolitan frontier, was the chief route for Turkish volunteers and contraband of war to enter Cyrenaica. The railroad terminus at Marsu Matruk, 300 kilometers west of Alexander, was connected by a good automobile road with Solum, a distance of 200 miles, and thus it was possible to cover the distance of 500 miles from Alexander in one day. Caravans then conveyed arms and ammunition in large quantities from Solum to the Turkish forces in Cyrenaica. Sailing ships loaded with contraband also landed near Solum where they could not be seized by Italian blockaders. The Egyptian telegraph operators also received telegrams for Constantinople via Alexandria and communication was practically uninterrupted.

These conditions were changed after December 15 by the Turkish cession of Solum to Egypt instead of to Cyrenaica, to which it had always belonged theretofore. Shortly after this cession Egyptian and British troops occupied Solum and suppressed the contraband trade. Lord Kitchener directed the strictest measures to guard against any violation of neutrality by conveying contraband and Turkish troops across the frontier beyond Solum. The telegraph operators were censored, and the British cruiser *Suffolk* arrived off Solum to enforce the observance of strict neutrality. These measures resulted in stopping 30 Turkish volunteers with two Russian aviators in their efforts to reinforce the Turks in Cyrenaica. But these measures did not prevent a large caravan of 175 camels to enter Cyrenaica from

Egypt, presumably via Fayum. This brought a large number of officers and men to aid the Turks.

The Italians protested at Paris against the contraband trade and open violations of neutrality across the Tunisian frontier. This protest was answered by a statement that Italy openly procured camels and provisions for her troops from Tunis and also purchased flying machines in France for her forces in Tripoli. The misunderstanding between Italy and France was such that the Italians finally ordered the seizure of two of the larger French steamers plying between Marseilles and Tunis, on which Turkish officers were suspected of being passengers. The French steamers *Carthage* and *Manouba* were seized off the coast of Sardinia, outside of Italian waters, and were taken to Cagliari where they were detained four days and released. On board the *Carthage* they found the French aviator Duval with an aeroplane that the Italians claimed was intended for Turkish military service. On board the *Manouba* there were 29 persons who claimed to belong to the second detachment of the Red Crescent society, while Italian officers claimed they were military combatants. The *Manouba* was obliged to land these 29 persons before proceeding on her voyage to Tunis.

The Italians were finally convinced that the aviator Duval did not intend to go into Turkish service and he sailed to Tunis. The 29 persons of the Red Crescent society were detained, and, after considerable correspondence and debates in the French Assembly, they were finally released by the Italians to the French government. Upon arrival at Marseilles these 29 persons were thoroughly examined and found to be all surgeons, nurses or sanitary attendants, and with one exception, they were allowed to proceed to Tunis and thence to the Turkish headquarters. The one officer who was not allowed to proceed had large sums of money in his possession and was not solely on duty with the Red Crescent society.

The French government earnestly endeavored to stop all contraband trade. January 17, the Russian steamer *Odessa* arrived at Sfax from Prevesa and the Tunisian officials found a large consignment of arms and ammunition concealed in the coal bunkers. This cargo of 360 tons of war material was seized by the French Tunisian officers.

January 25, the destroyer *Fulmine* seized the French mail steamer *Favignano* in Tunisian waters and made a thorough search with force without finding any contraband on board. This episode made considerable excitement among the Tunisians, and caused such an animosity against the Italians that a large number of Italian residents in Tunis left the country.

The French sent the armored ship *Henry IV* and four torpedo boats from Biserta to the southeastern border of Tunis to stop contraband trade, and enforce the obligations of neutrality.

ITALIAN NAVAL OPERATIONS DURING FEBRUARY UNTIL MARCH 15.

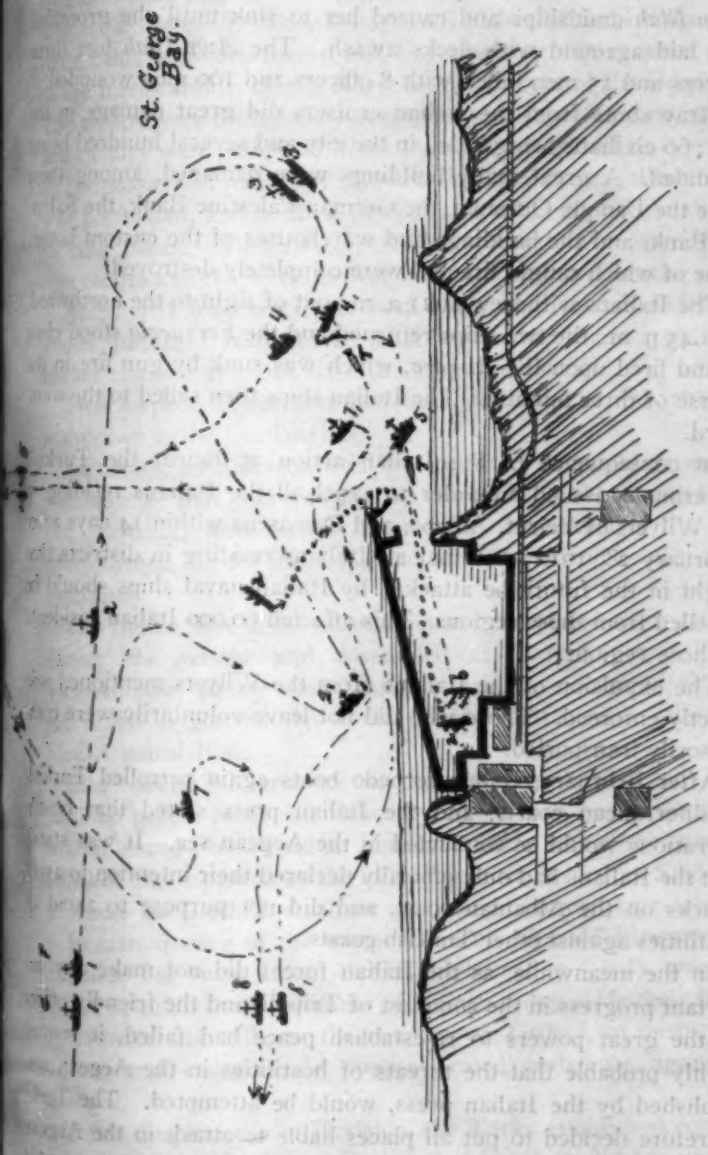
The Turkish armored coast defense ship *Awn-Illah* (Help of God) and destroyer *Angora* were lying at Beirut, and the Italians feared these ships would interfere with the transportation of Italian troops to the Red sea.

Rear Admiral Thaon di Revel arrived at Beirut with the *Ferruccio* and *Garibaldi* early in the morning of February 24. The *Garibaldi* steamed in close and fired a blank shot. The Turkish commander sent a boat with a flag of truce to the *Garibaldi*, called the *Angora* to slip her chain and anchor in his lee close to the mole, and made preparations to defend his ship.

The boat returned with a written demand upon the Vali of Beirut for the delivery of the two Turkish ships in the harbor before 9 a. m., when unless a reply was received he would proceed to attack the two ships and he would be governed by Article 2 of the IXth Convention of the Second Hague Conference.

The Italian cruisers proceeded to the eastward in St. George's Bay awaiting reply from the Vali.

The Vali received the written demand for the surrender of the two ships at 8.30 a. m., and was in the act of giving his consent; when, at 9 a. m., no answer having been received by the Italian admiral, the two ships opened fire on the *Awn-Illah* at 6000 meters, which replied slowly for about twenty minutes without making any hits. At 9.35 a fire broke out on board the *Awn-Illah* and ten minutes later the Turks hauled down the flag and abandoned the ship with the surviving members of the crew of 220 men. The *Garibaldi* stood close in and at 600 meters fired with the 76 mm. battery on the *Angora* without inflicting any damage. The *Garibaldi* then discharged a torpedo at the *Awn-Illah* but this deviated when half-way and ran in among a lot of lighters moored



a—Position of the torpedo destroyer *Angora*
a—Second position of *Angora* in fire-lee of *Asm-Illah*.
b—Position of *Asm-Illah*.
1—The Italian Cruisers *Ferruccio* and *Garibaldi* at 7 a. m.
2-2—Italians at 7.30 a. m. *Garibaldi* fired blank shot and *Asm-Illah* sent flag of truce to *Garibaldi*.
3-3—Position at 9 a. m. when Italian opened fire.
4-4—*Garibaldi* fired torpedo that missed.
5—*Garibaldi* fires second torpedo that sinks *Asm-Illah*.
5—Italians withdrew to the northward at 11 a. m.
7-7—Positions after returning at 2 p. m.
8-8—Italians sail to the westward.
T-T—Torpedoes launched by the *Garibaldi*.

within the mole and exploded causing six lighters to sink; ten minutes later the *Garibaldi* fired a second torpedo that struck the *Awn-Illah* amidships and caused her to sink until she grounded and laid aground with decks awash. The *Awn-Illah* lost three officers and 55 men killed with 8 officers and 100 men wounded.

Stray shots from the Italian cruisers did great damage in the city; 66 civilians being killed in the city and several hundred being wounded. A great many buildings were damaged, among them were the Banque Ottoman, the German Palestine Bank, the Salonica Bank, and the buildings and warehouses of the custom house, some of which caught fire and were completely destroyed.

The Italians withdrew at 11 a. m., out of sight to the northward. At 1.45 p. m., the two ships returned and the *Ferruccio* stood close in and fired upon the *Angora*, which was sunk by gun fire in the course of three minutes. The Italian ships then sailed to the westward.

In consequence of the Italian action at Beirut the Turkish government issued an order to expel all the Italians residing in the Wilyets of Beirut, Aleppo, and Damascus within 14 days after February 28, 1912; and that all Italians residing in districts that might in the future be attacked by Italian naval ships should be expelled from those regions. This affected 60,000 Italian residents in those regions.

The expulsion of the Italians from the Wilyets mentioned was strictly enforced. Those who did not leave voluntarily were compulsorily transported.

After February, Italian torpedo boats again patrolled Turkish Mediterranean coasts, and the Italian press stated that hostile operations would be conducted in the Aegean sea. It was stated that the Italians had only officially declared their intention to avoid attacks on the Albanian coast, and did not purpose to avoid all hostilities against other Turkish coasts.

In the meanwhile, as the Italian forces did not make any important progress in the conquest of Tripoli, and the friendly offices of the great powers to re-establish peace had failed, it seemed highly probable that the threats of hostilities in the Aegean sea, published by the Italian press, would be attempted. The Turks therefore decided to put all places liable to attack in the Aegean sea in thorough defence. Measures for this had been suspended during the previous month because they were given to understand

that the scene of war would be limited by the Italians to Africa.

The Turks began to strengthen the defences of the western approaches to the Dardanelles at Kum Kale and Sedil Bahr. The mine fields were reinforced and improved; 350 guns were added to the fortifications, chiefly taken from the forts of the Bosphorus. The troops were drilled daily at target practice and 40,000 infantry and cavalry were mobilized in the Dardanelles district.

The passage of merchant ships through the Dardanelles at night was prohibited, and because of the mine fields all were compelled to take pilots. Turkish torpedo boats constantly patrolled the approaches and the Turkish fleet was stationed at Nagara.

At Smyrna four large merchant ships were heavily laden with stones and held ready to be sunk in the narrowest part of the harbor channel at about six miles from the city.

Two torpedo boats that had been stationed at Smyrna were withdrawn to the Dardanelles.

An attack on Salonica was not expected so much because the commerce of that port was carried on chiefly by the Italian colony, and Austrians were largely interested. Nevertheless the Turks strengthened the fortifications and mine fields and reinforced the garrisons.

The Italian fleet in the meanwhile had completed all its refittings during the winter and assembled at Tarento and Tobruk. Vice-Admiral Aubry died March 4, and Vice-Admiral Faravelli succeeded as commander-in-chief. He in turn was relieved by Vice-Admiral Biale.

The ten Italian cruisers in the Red sea bombarded several Arabian ports; Midy, on February 29; Dubab (near Perim), on March 4. and Shiek Said on March 6. Midy was at the same time attacked and captured by the followers of the insurgent Said Idriss, to whom the Turkish-Arabian garrison of 60 men surrendered.

In consequence of the co-operation of the Said Idriss with the Italians, the ruler Iman Yahia proclaimed a "holy war," and called upon all the inhabitants of Yemen to lay aside their internal grievances and rally to the support of Turkey, to destroy Said Idriss, and energetically oppose armed resistance against the Italians.

After the blockade of Hodeida, the Turks established communications between European Turkey and Southern Yemen via Aden.

(CONTINUED IN NEXT ISSUE.)

DISCUSSION.

Navy Yard Problems.

COMMANDER E. L. BEACH, U. S. Navy.—This essay contains a valuable suggestion, that of regulating requests for alterations from ships in commission. The experience of sea-going officers must dictate to navy yards the necessity of certain asked for alterations and Mr. Otterson's method would bring the desirability of any particular alteration for one ship before the captains of all similar ships. This will be a step towards standardization. Mr. Otterson suggests that there be organized a "Fleet Board on Alterations" to be composed of the fleet engineer, ordnance officer, paymaster, medical officer, and naval constructor. It is suggested that an additional officer should be on this board, namely, the fleet repair officer. From the present naval bill it appears that the government will convert the collier *Prometheus* or *Vestal* to be a fleet repair ship. This ship will probably be fitted up to do work of far greater scope than the present small *Panther*. The last session of the House of Representatives passed legislation prohibiting repairs to be done by ship's crews while ships were at navy yards. Among ship's companies are expert machinists, boilermakers, coppersmiths, electricians, plumbers, etc. Experience as engineer officer ashore has brought me to believe that among the very best mechanics to be found at the navy yard are always men who have served enlistments aboard ship. Experience with the repair work has brought me to realize that enlisted mechanics on board ship can do just as good work as navy yard mechanics. The need of a navy yard results from the necessity of docking a ship and of doing work requiring tools of bigger capacity than can be installed aboard ship. The natural tendency of the legislation prohibiting ship's mechanics from doing ship work at a navy yard will result in keeping ships from navy yards as much as possible. A properly equipped repair ship, such as the *Prometheus* or *Vestal* is destined to be, would go far to lessening the frequency with which ships are sent to navy yards for alterations and repairs, and it is quite probable that with more ship work done by enlisted mechanics, whether of the ship's own force or from the fleet repair ship, some of the navy yard problems will disappear.

COMMANDER SUMNER E. W. KITTELLE, U. S. Navy.—The question of alterations to ships is already well considered by central authority, and with a decided resultant gain in economy. The Division of Material finally passes upon all alterations and makes its recommendations to the Secretary, after the alterations in question have been duly considered by the captains of all the ships concerned, by the division commander and the commander-in-chief, and after the various bureaus have contributed their advice. A broader or more comprehensive method could scarcely be devised, the sole drawback being the excessive time consumed enroute. A fleet board on alterations would doubtless tend to lighten the paperwork labors of

the flag officers, and to systematize consideration and thereby expedite decisions.

In considering the question of the number of our navy yards and the possible substitution of one very large yard for three of our present sites, my attention was called to a very clever solution by Captain Van Duzer, who has chosen a location on the flats of the New Jersey shore of New York harbor, above the narrows, and has there laid out a very complete plant, quite within the bounds of engineering accomplishment. New York is such a desirable location, considered from all standpoints, that this proposed plan commands consideration.

It takes a very broad type of mind, and a degree of unselfishness, apparently beyond our present average evolution, to consent to a general government policy that deprives our own little locality of a share of the government's annually expended moneys heretofore enjoyed. It is also a nicely balanced question, that of a national legislator's duty. How much of his allegiance belongs to his country and how much to his own district? Suppose on the one hand it is decidedly to the government's interest to abolish some unused navy yard, while on the other hand the local vote becomes angered at the mere suggestion of such loss? What shall the harassed statesman do in the premises? I think the solution will come when the office shall seek the man and not the man the office, from which one may calculate how long it will be before some navy yards are finally abandoned.

The questions of strategy involved in "Navy Yard Problems" have already been well considered and solved by accepted authorities, so that if we profit by the findings, we shall at least be building upon a foundation of sound strategy, without which disaster must sooner or later overtake us. Of course, if a powerful hostile fleet should find lodgment in our waters, while our own divisions are scattered at their respective bases we would be confronted by a very serious problem of concentration, but one that has by no means been overlooked by the Naval War College.

Sound strategy is cheap at any price, but after that is once secured we are free to pay closer attention to the government pocket-book, always remembering, what the devotees of the "pork barrel" are prone to forget, that even the most extravagant preparation is in the end millions less costly than the cheapest "marked down" war. If a concentration of navy yards is strategically sound then it should be had at all costs. If such consolidation weakens our position strategically, then all resultant economy is false.

While the only reason for the existence of navy yards is to dock, repair and victual the fleet, the question of labor must, nevertheless, be given a higher place in the problem than would at first seem apparent, not for the workman's own private sake, but in the government's interest, in the interest of economy and efficiency. So every reasonable endeavor should be made to secure and retain a good force of capable workmen, otherwise in emergencies green men have to be taken on, and the class of work turned out at once drops in both quality and output. For this reason Mr. Otterson's plan of assigning work to a navy yard, on the basis of

that yard's normal amount of emergency work, or in the final analysis upon the number of workmen employed, is worthy of consideration and trial. His plan will certainly tend to keep the number of workmen in all trades at a steadier average, and relieve the Navy Department of much importuning from the political friends of workmen discharged for lack of work.

If it is finally decided as a policy to maintain a certain number of yards, disposing of all others, then the work should be balanced among those retained in order that all may be in readiness for the unusual demands of war.

In assigning to each navy yard its quota of vessels for repair, the government has already covered this policy in a broad way.

COMMANDER J. B. PATTON, U. S. Navy.—1. The first part of this article proposes a form of procedure in handling requests for alterations. It differs from the present system only in requiring the division commander to prepare a new letter covering all ships of his division, when one ship asks for alteration; and in requiring the fleet commander to refer it to all divisions and then write another letter. This is suitable for any extensive alteration, and is now frequently done as shown by the reports of boards appointed to report on special matters.

2. The word "alteration" as now defined in the Regulations, includes any minor change in design or change in material used, notwithstanding the fact that nearly all "repairs" call for some change in design or material used, except for articles worn out by long use. These minor alterations can be settled satisfactorily by the ship's officers and navy yard, without reference to the division commander or Navy Department, and should be classed as "repairs."

3. The larger alterations should really be designated by the accounting department terms "changes and additions," and "repairs" by "wear and maintenance" or "casualty."

4. Many of the examples of alterations given seem too trivial to burden the flagship with, for example "foundation for evaporator pump," and therefore the author's scheme to make all alterations a division matter is not wise.

5: For the larger matters, it would doubtless be well to require the division commander to act on the matter, and recommend it for all ships, or one ship for trial, or for disapproval.

6. The fleet staff individually now pass on subjects coming before the commander-in-chief, and there would be nothing gained in having them act collectively on a subject in which, perhaps, only one would be interested. The present practice of appointing officers who are specially informed on the subject to be reported on, would appear the best. The idea could be better carried out by appointing a number of permanent boards to cover each class of alterations.

7. The question of the proper number and location of navy yards has been given careful thought by the Navy Department, and the proposal to abandon Portsmouth, Boston and New York, in favor of a navy yard

and naval base at Narragansett Bay is sound. There are some financial difficulties in the way, which have prevented the Department from definitely recommending this change. Therefore, there is a grain of comfort in having some one come forward and contend that we are all right as we are. But the great advantage that a base like Norfolk or Narragansett Bay has over New York is too apparent to be ignored.

8. A fleet anchored in New York harbor is only a "mob of ships." There is no room in North River for them, and at Staten Island they have to take their coal and stores when they can get them, and fleet routine is broken up. While at Hampton Roads the fleet is in full routine, and the ships pass in and out the bay, day or night, without pilots, and carry out their program of maneuvers; and at the same time they call for and get their coal and stores when they want them without interfering with their fleet work.

9. I believe in competition between navy yards to promote efficiency, but I agree with the writer that cheapness should not be the controlling factor in the distribution of work. A navy yard may make low estimates on work and receive the order, when they are so crowded with other important work that the new order may seriously interfere with it.

COMMANDER STANFORD E. MOSES, U. S. Navy.—Assistant Naval Constructor Otterson's article on Navy Yard Problems begins with a discussion of alteration to ships, and then shifts to the question of the desirable number of navy yards, and the purpose for which they exist. He makes a plea for the retention of our principal east coast yards, but does not mention those on the Pacific coast; or our over-sea naval stations. The paper discusses in general terms the distribution of work among the various yards; and lays particular emphasis, perhaps treats too seriously, the question of competition in manufacture.

The author deals with a few questions which seem to lie beyond the limits of navy yard problems.

It is suggested that a more logical treatment, or order of subjects, would have been to start out with the statement of the single purpose for which navy yards exist—the maintenance of the fleet—and then to consider the logical number, and the location of the yards we need. These points reviewed, there would then follow in natural order some consideration of the total expenditures, or of the total volume and character of work for the navy which is to be distributed among these yards.

With the work distributed upon any basis, perhaps upon one of those proposed by the author the next step would be some analysis of the character of this work.

All agree as to the purpose for which navy yards exist. They exist for the fleet.

As to the number and location of navy yards: probably a large majority of those who have studied the problem think that, for the present at least, we should retain the yards at Boston, New York, Philadelphia, Norfolk, Bremerton, and Mare Island; and naval stations at Guantanamo, Pearl Harbor, and in the Philippines. Hampton Roads and Narragansett Bay

should be developed as naval bases. This list represents a maximum number of naval establishments. Money should be guardedly invested in any naval station the retention of which is doubtful. The author need not have burdened himself with the problem of building up a single yard of abnormal proportions; there are other more pressing, and easier, problems; and it would be well to solve those first.

Consolidation and concentration of navy yards, when it comes (if it comes), will be a step-by-step achievement. The experience of England tells us this.

The distribution of work to our navy yards is now receiving systematic handling in the scheduled assignment of the various units of the fleet to established home yards; and in the regular rotation of ships at their respective yards. This is a great step in advance; and makes provision for perhaps three-fourths of all expenditures for labor. This program assures to the various yards a volume of steady employment which outweighs the smaller questions of competition in manufacture. With the work distributed to the various yards, the discussion comes to the character of work, and some analysis of it.

The general character of work at different yards will always be influenced more or less by local conditions, but the bulk of all navy yard work falls under one of the following three headings; alterations, repairs, and new work, including articles manufactured for issue.

Alterations are considered in the essay at some length, and somewhat academically. It is when the author suggests a new routine for the fleet that he seems to wander a little from the problems on shore. The Navy Regulations admirably cover the question of recommending alterations; and this routine is based upon the practice and experience of years. If officers concerned possessed a thorough knowledge of the regulations governing alterations and repairs, our navy yard problems would be simplified.

As to the suggested "Fleet Board on Alterations," the idea has some theoretically good points; but the organization of the fleet allows a board to be appointed as circumstances require, and the routine duties of the fleet staff include the functions of such a board. "Boards are long, and narrow, and wooden."

As a navy yard problem, proposed alterations should be viewed with suspicion, but each must be carefully considered lest a good idea escape. An alteration is in the nature of an invention, or improvement. "An invention is 1 per cent inspiration and 99 per cent perspiration," and the patent office proves conclusively that most improvements do not improve.

This question of deciding upon alterations is the most important problem touched upon in the essay. (The most important problem of all is never mentioned.) And it is this question of alterations to ships which demands, in the interest of both military efficiency and industrial economy, a close co-ordination between the officers afloat and ashore.

The author's tabulated presentation of fifty "fairly representative and typical" alterations might revive an old favorite theme of discussion, the object of which was to prove that those who go to sea in ships wish to be comfortable. Percentages are misleading when based upon *the number of items*, regardless of their relative importance; especially when

the proportion of military items is commented upon as not being as high as might be expected. The military and economical alterations given in the table probably involve more that nine-tenths of the expenditures of money, and nearly all problems come sooner or later to the question of cost.

The plan of altering ships by classes, while theoretically good, is open to some objections. Our ships, especially the larger ships, are now standardized in details of design. Sister ships are rarely twins. In the first five battleships of one class, there were four different arrangements of dynamo rooms, while, in the case of the latest type of ammunition hoist, a hoist fitted on one ship of a class could not be installed on a second ship of the same class; was disapproved by a third, and approved, with modifications, for a fourth ship of the class. Experience with one installation almost invariably suggests improvements, and this is another reason why it is not always advisable to make alterations by classes.

Next after the question of alterations comes the subject of repairs, an important navy yard problem, but scarcely touched upon by this essay.

The third class of navy yard work includes manufacture, and it is here that competition has been sometimes instituted. Objections to competition between the navy yards would be valid objections if this competition were carried to extremes, but it is largely confined to certain items of "repair" work, or manufactured articles, the total value of which is probably less than 10 per cent of the navy yard expenditures for labor.

Let us not stifle competition. There is no need to overdo it; but a certain amount seems necessary under conditions of government employment in order to secure the best attainable results. Gunnery has reached its most violent development, some may consider it a too violent development, but its spirit of competition has carried us far and will carry us farther. Year after year the records of past excellence become the points of departure for further progress. Our navy yards, let us hope, are entering a field of development analogous to the successive steps in the progress of gunnery and engineering afloat. It is well to remember that the jealousies and disputes which are the chief evils of over-stimulated competition, are also characteristic evils of idleness and stagnation.

No candid observer of our navy yard conditions to-day, comparing them with the past, can doubt that we have begun in our industrial work on shore a revolution as complete as that which has marked the regeneration of the fleet.

The principal objections raised to the spirit of competition in the fleet are largely traceable to the unusual youth of the majority of the personnel: a condition which is correcting itself. The navy yard work has been directed by a maturer element. The various bureaus and the commandant have directed and controlled all competition (the little competition which really exists), and the pleas for restraint, as made by one essayist and quoted by another, have, in the main, been foreseen and answered. Competition has been restrained and controlled; it has served a means instead of an end; it has sacrificed nothing important; it has kept down artificiality; there has been no attempt made to grade all competitors with exactitude.

Comparison of results may not suggest a way to increased efficiency, but it stimulates the loser, first to assure himself that he has fairly lost, and then to think for himself how he may fairly win. There is nothing so helpful as to make a man think. Pessimists may say that the loser may figure on winning unfairly, so long as he wins, but we must grant to these imaginary people the same standards of honor.

The most important of all navy yard problems is that of organization. For several years we have been trying various systems of management, and now, at last, as the result of trial and experience, there is crystallizing a definite and uniform method of procedure. The author has not touched upon this problem, and therefore a discussion of it is hardly pertinent. The subject is mentioned in the hope that some one may bring it under discussion in the broad spirit in which Assistant Naval Constructor Otterson has in his essay discussed the navy yard problems as he sees them.

An Improvement in Floating Dry Docks.

(SEE NO. 142.)

CIVIL ENGINEER LEONARD M. COX, U. S. Navy.—The plan proposed by Civil Engineer Cunningham is a most novel and interesting one, and appears to be the nearest approach that has yet been made toward the solution of the problem of an expansible dock. Civil Engineer Cunningham's first invention, developed a number of years ago, provided a dock which is capable of being used as a whole, or by sections as separate dock, and made it possible to increase the length whenever the demand made it desirable. In his new invention he has provided not only for future increase in length, but for increasing the lifting power as well, by the simple device of pontoons of varying dimensions.

The idea of varying depths of pontoons, and thereby making lifting capacity expansible, is one which must appeal very strongly to those who have encountered just such a problem during the last decade, when the increasing size of ships threatened to make dry docks obsolete almost as soon as they were completed. The Algiers floating dock was completed in 1902, and the "Dewey" dock in 1906. Each was considered the largest structure of its type at the time, and yet, in 1909, the writer was called upon for a report on the ways and means of increasing the capacity of both docks, so as to provide for lifting 30,000-ton vessels. In each case the beam of the dock was sufficient, but careful investigation diclosed the fact that, in the case of the Algiers dock, it was impossible to provide this extra lifting capacity without virtually rebuilding the structure. In the case of the "Dewey" dock, some five or six plans appeared practicable, but the cheapest and best involved an estimated expenditure of $300,000.00, and so increased the depth of pontoons, and, consequently, the working depth of water at the mooring, as to render the proposition inadvisable. Had either of these docks been built on the plan now proposed by Civil Engineer Cunningham, it would only have been necessary to detach a certain number of the center pontoons and place in their stead pontoons

slightly deeper and with considerable increase in length. The pontoons removed could easily have been converted into tending floats, or even small dry docks, for torpedo craft.

As regards the future lengthening of a dock of this type, the fact must not be lost sight of that such lengthening should be accomplished by the addition of two (rather than one) new sections, since it is inadvisable to bring a through joint at the center of the dock. For commercial purposes this caution is not necessary, since it is the current commercial practice to place slight reliance in the longitudinal stiffness of the dock. For naval purposes, however, the loosely connected sectional dock would not be tolerated, and the theory of design assumes that the side wall girders carry the bending moment due to the ship load and flotation. A central joint could be made of such strength as to provide for the maximum bending moment usually coming at the centre of the dock, but these joint sections would of necessity be so cumbersome as to make it cheaper to rivet them solidly, thereby sacrificing the ease of self-docking claimed by the inventor. In any event docks designed on this plan should anticipate future expansion by the use of low unit stresses, or increased load assumption.

One of the most valuable features of this design lies perhaps in the possibilities offered for rapid emergency construction. Should the need for such a dock arise suddenly, instead of waiting from one and one-half to two and one-half years for the delivery of the structure, contracts could be awarded to different firms for the side walls and various pontoons, and the whole assembled upon delivery. In time of war it would be possible to construct a 30,000-ton dock on this plan in four months time. Another advantage which seems well worthy of consideration is the ease and comparative safety with which such a dock could be towed long distances at sea. Instead of the risk attending the transportation of the dock as a whole—and only those who are familiar with the towing of the "Dewey" to Manila can realize the immensity of such an undertaking—it would be a comparatively safe and simple undertaking to tow each pontoon separately, and to so construct side walls as to enable them to be floated horizontally and towed as ordinary lighters.

CIVIL ENGINEER F. H. COOKE, U. S. NAVY.—The ideal type of floating dry dock, for naval purposes at least, appears to be the closest approximation to the "solid" or "box" type, compatible with safety and convenience of self-docking. Other important considerations are the ability to enlarge the dock with minimum expenditure of time and money, and rapidity of first construction; this latter point appears to be of prime importance, and under certain conditions might well be the determining feature of the design.

The type of dock proposed by the author appears to satisfy the requirements of facility of self-docking, ease of expansion, and rapidity of construction, to a marked degree, especially the two latter, in which the proposed type seems to possess very considerable advantage over the "Dewey" type. It seems to the writer, however, that there is too great a sacrifice

of longitudinal rigidity in breaking the continuity of the side walls. The ability to separate a dock into two or more smaller docks, self contained though each may be, does not appeal to the writer as of material advantage, per se, especially when moorings must be shifted, new moorings provided, connections made and unmade, etc., and when this ability is had at the expense of side wall continuity, it appears to be rather dearly bought.

As to expansion lengthwise, it appears to the writer that the continuous side walls of the original dock could readily be designed to admit the addition of a pontoon or pontoons at either or both ends; such metal as might be required to give the lengthened dock the requisite rigidity would, as surplus in the original length, be doing good service in decreasing deflections.

As to expansion vertically, it would appear that increase in lifting power without increase in length could well be had by constructing a low steel bulkhead across each end of the dock, to say, within one foot of the top of the blocks. For a dock 600 feet long by 150 feet overall width, an increased depth of 3 feet would increase the displacement by about 7500 gross tons, and this without change in pontoons or increase in depth of dock berth. The joints between pontoons, and between pontoons and side walls, should be made sufficiently water tight against the small head they would be required to resist, without difficulty or complication. Suitable drainage connections could easily take care of any leakage, the deck being given a camber for the purpose.

As to rapidity of construction, it appears to the writer that this need be not at all reduced were the side walls made continuous.

Although the dock would naturally be built on square lines, and of practically uniform detail, it is possible that perfect matching of holes would be found wanting, when it was sought to replace a pontoon by a spare. As a pontoon self-docked would materially reduce the length of the dock available for the simultaneous docking of ships, the provision of a spare pontoon does not seem to the writer to be justified solely for this purpose, but a spare might be exceedingly useful in case of injury to a pontoon.

The economy of first cost effected by reducing the depth of the end pontoons appears to the writer as of doubtful advantage, considering the permanent decrease in end displacement occasioned thereby, which might be of great disadvantage under certain conditions, as of a ship badly down by the bow or stern.

In the author's proposed type, as well as in the dock with continuous side walls, it would appear not difficult to make suitable connections between pontoons and walls, connections which would virtually make the transverse girders or trusses of the pontoons, and the vertical frames of the side walls, continuous U-shaped structures, yet which could easily be made and unmade by even working within the side walls. The pumps, which it would appear should be set close to the bottoms of their respective pontoons, could be readily coupled to and uncoupled from their vertical shafts, without disturbing the shaft stuffing boxes. Considerable additional longitudinal rigidity could be had by connecting together the ends of the

longitudinal girders which would naturally be built in the pontoons; these connections could be made of great strength, yet with their lower portions above water at light draft and accessible for inspection and repair from above. It would appear that the additional first cost of such connections, and the additional labor to make and unmake them, would be amply repaid by the gain in rigidity, and that such connections, together with continuous side walls, should go far toward approximating the "solid" type, while providing a design admitting of rapid construction, easy enlargement, and convenient self-docking.

The True Story of the America.

(SEE No. 142.)

In the communication of Mr. William Barry Meany, M. D., which appeared in the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, No. 142, June, 1912, under caption "The True Story of the America," second paragraph, line two, page 748, which reads, —"and wherein no mention of, or any reference to, the name of Commodore John Barry appears—reads:" It should have read —"and wherein no mention of nor does any reference to the name of Commodore John Barry appear—reads:"

PROFESSIONAL NOTES.

Prepared by LIEUT.-COMMANDER RALPH EARLE, U. S. Navy.

SHIPS OF WAR, BUDGETS AND PERSONNEL.

ARGENTINE REPUBLIC.

VESSELS BUILDING.

Name	Displacement	Speed.	Armament	Builders	Remarks
Battleships					
Rivadavia.....	28,000	22.5	12 12-in., 12 6-in.	Fore River Co.	Launched Aug. 26, 1911.
Moreno.....	28,000	22.5	same	New York Co.	" Sept. 28, 1911.

The construction of the new port at Valparaiso will provide a harbor capable of berthing the largest modern ships and will include: A breakwater, 945 feet long; a quay wall 2066 feet long; strengthening and extending the Fiscal wharf to a length of 1214 feet; a quay wall 690 feet long; a jetty 820 feet long and 328 feet wide; a coal wharf 656 feet long and 100 feet wide, including coal transporters, hoists, cranes and railway, etc. All the necessary customs and other warehouses, administration buildings, lighthouses and coastguard stations are also to be provided. The new harbor, when completed, will have a depth of 40 feet of water.—*Shipping, Illustrated.*

AUSTRIA.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Radetsky.....	14,500	20	4 12-in., 8 9.4-in., 20 3.9-in.	Trieste	Commissioned
Zrinyi.....	14,500	20	same	"	"
Erzherzog Fr'z Ferdinand	14,500	20	same	"	"
Viribus Unitis.	20,010	20	12 12-in., 12 5.9-in.	"	Launched June 24, 1911
Tegetthof.....	20,010	20	same	"	Launched Mar. 21, 1912
VI.....	20,010	20	same	"	Laid down Aug., 1911
VII.....	20,010	20	same	Fiume	Laid down 1912

"VIRIBUS UNITIS."—Sketches show this to be a vessel with two stacks, two masts, and four center-line turrets each containing three 12.2-inch guns. The length is 488.7 feet, the beam is 88.5 feet, the displacement is 20,500 tons, and speed will be greater than 22 knots. Battery is twelve 12.2-inch 50-caliber guns, twelve 6-inch and eighteen 2.8-inch guns. Armor belt about 11.5 inches in thickness, protective deck 2.4 inches, turrets 12 inches.

There are four under-water tubes, one in bow, one in stern, one on each side. The torpedoes are 20.7 feet long, weighing 2794 pounds, and give at 3280 yards a speed of 40 knots.

Battleships *VI* and *VII* which follow are to be similar, but are to have six tubes.

NEW TYPE OF GUN AND ARMOR PLATE.—A new gun of 13.7-inch caliber has been constructed at the Skoda works of Pilsen, and proved. This gun is the type designed for the arming of the battleships succeeding the *Viribus Unitis* which carry twelve 12-inch. This new gun is exactly like the guns built by Vickers and Armstrong for the English service. The shell will weigh 1518 pounds, and will give a muzzle energy of 22,000 tons. The new battleships will be armored with some new plates called "electric armor," made by the Wittkrowitz works which manufacture the most of the armor plates for the Austrian Navy. The principal superiority of these plates will be in an annealing obtained by their passage through an electric furnace at a certain fixed temperature. This operation will give a metal with a very close grain, perfectly regular and homogeneous, with a resisting power much superior to the cemented steel of the Krupp process, and also at less cost.—*Le Yacht.*

DEFECTS IN NEW BATTLESHIPS.—A serious error has been made in the calculations of the weights of the battleships of the *Viribus Unitis* class, which prove to be overloaded by 1000 tons, their armor belt is submerged, and their maneuvering qualities greatly reduced. This error proved to be due, at least in part, to the fact that in the calculation the weights of the gun carriages were neglected. A lighter type of mounting was tried, then lighter armor plates, but neither sufficed, and the four *Viribus Unitis* are of too deep a draft.—*Le Yacht.*

ACTIVE SQUADRON.—A division of cruisers always in shape to go to sea was added to the active battleship squadron. This division comprises the battle cruisers *Sankt Georg* and *Maria Theresa*, the scouts *Admiral Spaun* and *Aspern.*—*Le Yacht.*

BRAZIL.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
M. Geraes,....	19,250	21	12 12-in., 22 4.7-in.	Elswick	Commissioned
Rio de Janiero,	28,000	22	14 12-in.. 20 6-in.	Elswick	Laid down Feb. 1910

The battleship *Rio de Janeiro* has been greatly delayed by modifications in the design. She is 632 feet long and 89 feet beam. The side armor is 9 inches, as is also the turret armor. There are three armored decks (2 inches, 1½ inches, and 1 inch). Will be driven by Parsons' turbines, and have Babcock & Wilcox boilers.

A cruiser *Ceara* is on the ways, also three submersibles of the Laurenti type have been built at the F. I. A. T. San Giorgio yard, Spezzia.

A bill to authorize the construction of a new harbor in Brazil for naval purposes, at a cost of $20,000,000, is reported to be at present before the government, and the Bay of Ilha Grande has been suggested as the most suitable spot. The proposal includes erection of docks and buildings, but the provision of defence and similar work would involve an additional expenditure of $10,000,000.—*Shipping*, Illustrated.

CHILI.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Constitucion..	27,500	23	10 14-in., 12 6-in.	Elswick	Laid down Nov. 1911.
Libertad.....	27,500	23	same	Vickers	" " Dec. 1911.

The names of these battleships seem to be uncertain as yet. By some authorities they are the *Santiago* and *Valparaiso*.

According to a cablegram from Santiago de Chile, the Chilian Government has decided to have another battleship built in a British yard. Some months ago Sir W. G. Armstrong, Whitworth & Co., Newcastle, secured the contract for the first vessel, which it is understood will have a displacement slightly over 28,000 tons and a length of about 620 feet. Her armament will consist of ten 14-inch guns in five turrets and sixteen 6-inch guns. It is assumed that the second battleship will also be secured by the Armstrong Co., although it may be built at Barrow by Messrs. Vickers, Ltd., who are understood to have been associated with the Armstrong firm in the protracted negotiations which have been conducted with the Chilian Government.—*Shipping*, Illustrated.

The ships are practically sisters of the English *Orion* carrying heavier guns.

Six large destroyers, of a displacement of 1500 tons, a length of 320 feet, and beam of 32½ feet, with a battery of six 4-inch guns are being built. They are to steam 31 knots. Are fitted with three 18-inch torpedo tubes.

FRANCE.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Courbet.....	23,500	20	12 12-in., 22 5.5-in.	Lorient	Launched Sept. 23, 1911
Jean Bart.....	23,500	20	same	Brest	" Sept. 22, 1911
France.....	23,500	20	same	St. Nazaire	Laid down Aug. 1, 1911
Paris.....	23,500	20	same	La Seyne	" " Aug. 1, 1911
Bretagne.....	25,000	20	12 13.5-in., 24 5.5-in.	Brest	" " May, 1912
Provence.....	25,000	20	same	Lorient	" " May, 1912
Lorraine.....	25,000	20	same	A private firm	" " Aug. 1912

NEW FRENCH "DREADNOUGHTS."—The French Navy is following the lead of Great Britain and the United States by increasing the caliber and reducing the number of guns in her main batteries. The three new battleships, the *Lorraine*, the *Bretagne*, and *Provence*, of 23,500 tons, will carry twelve 13.5-inch guns, all placed on the longitudinal center line of the ship. This policy is the cause of much hostile criticism by the press and many naval officials, Admiral Daveluy being opposed to any gun greater than the 12-inch. They are reported to be designed to carry twenty-four 5.5-inch guns, and to have the twelve 13.5-inch guns in three turrets, four in each.

THE FOUR-GUN TURRET.—After tenaciously sticking to primary and secondary guns of smaller caliber than most of the first-class naval powers, France has suddenly—doubtless under the influence of its capable Marine Minister, M. Delcassé—decided upon mounting four 12-inch guns in each of the three turrets with which her new battleships are to be fitted. This is an experiment of first-class importance which will be closely watched by the rest of Europe, and by no one more closely than our own warship designers, who have steadily refused, so far, to depart from the twin-turret system of mounting. Although the authorities deny it, there has undoubtedly been trouble in regard to mounting three guns in the turrets of the Austrian *Dreadnoughts*. The gunmountings themselves are of extraordinary weight, and this difficulty will be greatly intensified if a fourth gun be added by our friends, the French. Yet their engineers have on many occasions startled the world by their ingenuity and practical proposals, and they may yet show the way in four-gun turrets without having any abnormal difficulties, outside of those which are bound to attach themselves to any such bold proposal as this. The smashing power of a comparatively short ship with three 4-gun turrets mounted on the middle line, would be enormous, as no less than twelve primary guns would be available for every broadside the captain wished to fire; while four-gun salvoes ahead or astern would also form a feature of the plan of concentration.—*United Service Gazette.*

SHIPBUILDING OF 1913.—There will be 51 war vessels under construction:

Eleven battleships.	One transport.
Fifteen destroyers.	One river gunboat.
Twenty-one submarines.	One despatch boat.
One mine layer.	

The large proportion of battleships is worthy of note, as is also the mine layer and gunboat. The ships that will be completed in 1913, and that will take their batteries before the first of January, 1914, number 19.

The two to be completed this year are the *Jean Bart* and the *Courbet*, which were launched respectively at Brest and Lorient in September last. These vessels are 540 feet in length, 88½ feet in beam, and at 29 feet draft displace 23,100 tons. The Parsons' turbine machinery, of 28,000 shaft horse-power, is to give them a speed of 20 knots. The five battleships now in progress are the *Bretagne* and *Provence*, building at Brest and Lorient, and the *France*, *Paris*, and *Lorraine*, building by contract, the first at St. Nazaire and the second at La Seyne. These are to be generally of the same dimensions as the *Jean Bart*, but 500 tons more is allowed for displacement on the same draft, and, in consequence, the power of the Parsons' turbines will be 29,250 shaft horsepower, to give 20 knots speed. Of the four new ships to be laid down, two will be commenced in the government dockyards on May 1, next year, and two at Brest and Lorient respectively on January 1, 1914. Although no official particulars are given regarding these vessels, it is understood that they will be larger than those now in progress, the displacement tonnage being about 25,500 tons, which will involve a further increase in power to ensure the same speed. As regards the armor, the thickness of the main broadside belt in the *Jean Bart* is 11 inches, tapering fore and aft, with 7-inch armor up to the upper deck, while the bulkheads are also of 7-inch armor. The gun-barbettes are of 10½-inch armor, and the secondary guns are placed on the broadside, behind the 7-inch upper belt. In the *Jean Bart* the armament includes twelve guns of 12-inch caliber, twenty-two of 5.5-inch caliber, and four 3-pounders. In the five later ships of the *Bretagne* type there will be ten 13.39-inch guns, twenty-two 5.5-inch, and four of 1.85-inch bore. There will be four submerged torpedo tubes. The complement of these ships is to be 34 officers and 1075 men. So far as the ships to be laid down next year are concerned, the prospects are in favor of corresponding armament, the 13.39-inch being regarded as sufficient.

No cruisers are provided for, and as regards the torpedo-boat destroyer program, nine vessels are to be completed next year, seven of them at private works, and two in the dockyards. Three will be "continued," and three will be laid down. The length of the later vessels in progress is 265 feet 9 inches, the beam being 25 feet 7 inches, and at 9 feet 10 inches draft the dispacement is 850 tons. These are twin-screw turbine-driven ships, and the armament includes two 3.9-incn and four 2.56-inch guns. Of submarine-boats, eight will be completed, ten continued, and three will be commenced. The submarines are steadily increasing in size. These latter vessels are to be 242 feet 9 inches long and of 19 feet 8 inches breadth. Internal-combustion engines of 4800 horse-power are to be fitted, in order that the boats may have a speed on the surface of 20 knots, a fact itself illustrative of the great advance made in this type of craft. There will be eight tubes for launching torpedoes, and the crew will include three officers and 37 men.

Certain miscellaneous ships are included. There is in progress a submarine-mine-laying ship called the *Cerbère*, of 566 tons, and with machinery of 6000 horse-power, to give a speed of 20 knots. The vessel will carry one 2.95-inch gun, and will be manned by a crew of three officers and 62 men. This vessel was put in hand at St. Nazaire on August 5 of last year. A transport named the *Seine* is also in progress, the displacement being 3160 tons and the speed 12 knots. Next year there is to be laid down a gunboat to be called the *Balny*, of 214 tons, to carry six 1.46-inch guns. Another special ship to be laid down is a despatch vessel, which will have a displacement of from 1600 to 1800 tons, with a speed of 17 knots. She will carry two 5.5-inch and six 2.95-inch guns. The total credit for new construction will amount to nearly 7¼ millions sterling for direct expenses, and £360,000 for miscellaneous expenses.—*Moniteur de la Flotte.*

FAST DESTROYER.—The destroyer La Dague made on its trials in the Lorient 33.118 knots. A bonus of 60,000 francs will be allotted the builders. —*La Vie Maritime.*

MINES.—A new model, the Harlé, torpedo and mine has been adopted, and the Navy Department has just ordered 1000 of these. The defence mine weighs 1100 pounds, and the blockade mine 880 pounds. The charge of gun cotton in each is 132 pounds. This mine is very convenient and can be employed where the current is very strong without inconvenience. The aim of a torpedo should never be, properly speaking, that of sinking a ship, but to injure it so severely that it will be out of action for several days at least. Calculations to this end show that a 132-pound charge of gun cotton is easily sufficient to stave in the double hulls of actual warships.

For mine layers the *Cassini* at Cherbourg and the *Casablanca* at Toulon have made trials. They were fitted to carry and lay 97 Harlé mines. They are fitted with a railway for launching purposes, and lay 60 mines per hour, 180 feet apart, on a cable of 9000 yards length. Fourteen knots speed was used in trials. The trials were not satisfactory, and the use of larger mine layers is being considered.—*Le Yacht.*

DEVICE TO RAISE SUBMARINES.—Experiments have been made at Cherbourg with a novel device to raise submarines. This consists of a watertight canvas bag or balloon that is attached to the hull of the submarine and filled with compressed air. Experiments demonstrated that a weight of 25 tons can be lifted in this manner.—*Marine Rundschau.*

FORM OF SUBMARINES.—While the French still retain 30 per cent as the proper emerged volume in their submarines of 800 tons, the English are content with but 10 per cent for their submarines.

The English submarines are smaller in proportion than the French and their under-water navigation is easier and more comfortable.

This advantage is gained at the cost of inconvenience of surface runs, but the more one increases the size of the submarines, the more these difficulties disappear.

In England the form of the submarines is of an inverted mushroom. In France they are built like a destroyer.

The sketches show these forms, both types represented as making a surface run.

English French

The Italians have taken 15 per cent as the proper emerged volume, with the *Laurenti* type adopted in 1912. These look as do the French but are larger and deeper. The stern slopes into the water. The English are ordering vessels of the *Laurenti* type.—*La Vie Maritime.*

Cruiser *Foudre* has been fitted with a platform, between the funnels, for the stowage of the hydro-aeroplane *Ente.*

FRENCH NAVAL OFFICERS.—M. Delcassé has taken in hand the personnel of the French Navy, and especially designs to improve the position of the senior lieutenants. They are to have duties corresponding to their seniority and experience, and the first 120 on the list are to be assigned to special positions of responsibility. It does not appear that emoluments will be affected, unless the employments should bear special rates of pay. In another direction the Minister has adopted a measure which seems very wise in view of recent events in the French fleet. There is to be a special service of security in the larger ships, and in each vessel a commander or senior lieutenant will be responsible for the duties. In the ships of the *Danton* class, and in armored cruisers of more than 12,000 tons, the officer assigned to the duties or specially appointed will be a commander (*capitaine de frégate*) and, in ships of at least 9000 tons, a lieutenant. The commanders now in the *Dantons* are to transfer their present duties, and will be designated *chefs du service de sécurité.* The circular does not enter into the details of internal administration, and there is no indication of the manner in which the existing duties of these commanders are to be executed. In cases where there are to be two commanders the second will be appointed at once. The exact nature of the duties does not seem to have been defined, but they will doubtless be concerned with the repression of disorder, the prevention and discovery of cases of *sabotage,* and the care of various disciplinary matters.—*Army and Navy Gazette.*

PERSONNEL.—The following order was promulgated by M. Delcassé the 20th of May:

The increase of the number of duties in the sea-going life renders it more necessary than ever that the Department be informed very exactly on the special aptitudes of each of its senior officers, in order to assure the most efficient detailing of them.

I have decided, therefore, upon establishing individual records, and each commandant will be able, independent of the general value which he has formulated concerning the worth of an officer and of his manner of doing duty, to indicate in an exact manner for every captain under his orders: First, his aptitude for commanding afloat; second, if it should happen that a captain fills the duties of security officer, or second in command of a battleship, the ability of this senior officer to do the duties of second in command.

Also there will be a space to report for each officer serving at sea, the suitability of the officer to be appointed later to any special post as security officer.

The commanders of each naval force will be enabled, having this information on file, to form equally their personal opinions on points which should be indicated.

Considering the great importance that these estimates of officers will have as well for the officers themselves as for the best efficiency of the naval service, I do not doubt but that every officer having this honorable but delicate duty of commenting on his subordinates will know how to acquit himself with impartiality, firmness, and the truthfulness which is imposed by such a circumstance.—*Moniteur de la Flotte.*

THE FRENCH IN THE MEDITERRANEAN.—The decision of the French Government to maintain the two-power standard in the Mediterranean has been come to at an opportune moment, and not a day too soon. Since the war of 1870-71 the French people have had all their thoughts concentrated on perfecting their army, and they have accomplished this task so well that experts predict quite a different fate to that which befell it in the great war, should hostilities unhappily ever again break out with their Continental neighbors. If the same devoted attention is now given to perfecting her navy La Belle France will soon hold once more the power to cement the peace of Europe. Her plan with regard to the Mediterranean goes to show that even without the definite alliance which certain parliamentarians are at present clamoring for, the word of Great Britain is in France considered as good as her bond. It proves also that the policy of the two countries lies along the same course and that though not tied together like chariot steeds, the *entente* nations are content to run side by side in harmony, each working for the maintenance of the world's peace.—*United Service Gazette.*

THE FRENCH IN THE MEDITERRANEAN.—In view of discussions in the press and the debate in the House of Lords on the Mediterranean situation, a statement showing the present distribution of the French fleet, as recently reorganized, will not be without interest. The system adopted resembles in its broad features the organization of the British and German fleets, and answers to the ideas of Admiral Germinet and Admiral Lacaze, who was formerly chief of that officer's staff and is now chief of the Minister's Cabinet, as well as to the conception of Capt. Daveluy, expressed in his book "L'Esprit de la Guerre Navale." There are battle squadrons complete, with cruiser squadrons and auxiliaries, and the sea-going destroyers are where they are likely to find the enemy. The fleet in the Mediterranean with its base at Toulon includes the first and second battle squadrons. The first squadron is constituted of the six *Dantons* (*Danton, Condorcet, Diderot, Mirabeau, Vergniaud,* and *Voltaire*), and the second squadron of the *Patrie, République, Justice, Verité, Démocratie,* and *Suffren.* The attached cruiser squadron consists of the best armored cruisers, *Edgard Quinet, Ernest Renan, Jules Michelet, Léon Gambetta, Jules Ferry,* and *Victor Hugo.* There is also at Toulon the "first group" of the reserve squadron, which, however, seems at present to consist of one vessel only—the protected cruiser *Jurien de la Gravière*—and the armored cruiser *Waldeck-Rousseau* is at the port. It is anticipated that in the course of December the *Dreadnoughts Courbet* and *Jean Bart* will join the second battle squadron, when the *République* will go to the reserve and the *Suffren* will proceed to the North. Attached to the Mediterranean forces are about 40 destroyers. The first flotilla comprises 12 boats of 750 tons, and the second flotilla 12 of 400-450 tons. One-half of the latter, *i. e.*, an "escadrille" under a commander, is to be based on Ajaccio. The third flotilla comprises seven destroyers of the *Fanfare* and *Mortier* types, which are to be on the Algerian coast, and seven others with reduced complements at Toulon. There are also the mine layers *Cassini* and *Casablanca.* In

addition are, or soon will be, flotillas of submarines—each of six boats with a *capitaine de frégate* in command in a destroyer—at Toulon, Bizerta, and Oran, and these will be strengthened in December.—*Army and Navy Gazette.*

THE OCEAN AND CHANNEL.—It will be seen from the above statement that the flower of the French fleet is in the Mediterranean, and that the intention is to send the new ships to those waters as they are completed. The third battle squadron, which has its base at Brest, and normally has reduced complements, consists of the older battleships—*Charlemagne, St. Louis, Gaulois, Jauréguiberry, Masséna,* and *Bouvet.* The cruiser squadron, with full complements, consists of the *Gloire, Condé* and *Marseillaise,* and there is a group in reserve, with nucleus crews, at Brest, comprising the other armored cruisers—*Dupetit-Thouars, Gueydon, Amiral Aube,* and *Montcalm.* Attached to the squadron, and under the command of a captain, are two destroyer flotillas, each of 12 boats of which three-quarters have full complements. There are also submarine flotillas at Calais, Cherbourg and Brest, comprising about 30 boats of the latest classes, and to each flotilla a destroyer is attached. The old defensive flotillas now comprise only the older boats for local use, and have been brought under the orders of the naval prefects at the ports. The mine layers are the *Pluton, Cerbère, Hache, Massue, Baliste,* and *Flamberge,* which vessels have special complements.—*Army and Navy Gazette.*

LOSS OF THE "VENDÉMIAIRE."—This vessel was a *Laurenti* type submersible launched July 7, 1910, at Cherbourg. Dimensions: displacement on surface 398 tons, length 167 feet, beam 16.08 feet, twin screw, carrying seven torpedo tubes. On Saturday, June 8, 1912, the third squadron steaming from Brest was, at about 6.50 a. m., 5 miles N. 53 W. of Cape de la Hague, the Race of Aldernay, in which place it was to be attacked, according to a prearranged program, by the submarine flotilla of Cherbourg.

The lookout on the battleship *St. Louis,* the flagship leading, sighted dead ahead and close aboard the periscope of a submarine, which later proved to be the *Vendémiaire.* The alarm was given, but already the ram of the battleship had hit the submarine. This vessel sank at once in 59 fathoms of water. The engines of the battleship were backed and helm was put hard aport on the alarm, but it is estimated that the submarine's periscope was sighted but 150 yards ahead, and to cover that distance at 10 knots takes but 30 seconds. The spot was buoyed, but the strong currents carried the buoy away. The squadron waited an hour then steamed to Cherbourg leaving a cruiser and a destroyer behind. Lieutenant Prioul, Ensign Audie and 21 men were lost.

The strong currents are supposed to have carried the submarine further than was figured on by her commander, and the difficult navigation was the real cause of the disaster.

REPORT ON LOSS OF "VENDÉMIAIRE."—The commission of inquiry reports that the testimony of all witnesses agrees and the injuries to the ram show than the ram of the *St. Louis* struck abreast the tower of the submarine, the latter being cut in two. The forward part plunged to the bottom and disappeared, the after part remaining afloat an instant, then sank after chafing along the whole port side of the *St. Louis.* The depth of water was 53 meters or 29 fathoms. Great ebullition of air for as long as five minutes after the sinking of the submarine showed that she completely filled with water. There is no doubt but that all the crew died suddenly. The currents have drifted the submarine and the commission decides that it is absolutely of no use to try to raise her.—*Moniteur de la Flotte.*

M. Laubeuf, formerly of the French Navy, and one of the principal inventors of submarines, commenting in *Le Yacht* on the recent *Vendémiaire* disaster, says that the bigger submarines become the more probable is it

that disasters will occur. Although he instances the difficulty of the makers of internal combustion motors in keeping pace for practical purposes with the higher horse-powers necessitated by increased displacement of submarines, his main argument is based on the fact that naval tradition is so strong that any officer in command of a detachment of submarines insensibly adopts the combined formations which obtain with above-water ships. He argues that with small submarines the risks then incurred were less than with large ones. On the other hand, he contends that the whole principle of submarines working together is entirely wrong, and more or less responsible for most of the disasters that have occurred in the various navies.

M. Laubeuf's contention is that every submarine ought to be regarded as an individual unit, fighting without regard to its consorts. He even suggests that anything in the nature of co-operation is a weakness—the presumption being that supposing two submarines of a conventionally worked flotilla to be discovered, the positions of all the rest are likely to be located therefrom. As regards the *Vendémiaire* disaster itself, he points out that for practical purposes submarines maneuvering in peace-time are compelled to encounter war risks. In mitigation of such, he suggests that maneuvers when there is any fog about should be strictly forbidden, as a periscope in a fog is hopelessly unreliable to anyone attempting to estimate a distance with it. His second argument under this head is that it is fatal for a ship chancing to sight a periscope to do anything in the way of seeking to evade it by altering course. His ground for this opinion is that it is practically impossible to tell the direction of the submarine from merely sighting the periscope, and that the only course for the big ship is immediately to go full speed astern. On these lines, he thinks, submarine disasters from collision could mostly be averted.—*United Service Gazette.*

COMMENTS ON CAUSE OF LOSS OF "VENDÉMIAIRE."—The *Moniteur de la Flotte* says that poor periscopes can be blamed for her loss and for that of the *Pluviôse*. All commanders of submarines complain of their periscopes, those furnished ten years ago were excellent, those provided now—unbelievable fact—are poorer and poorer. Those given to the new vessels are less clear than those given to the *Morse*, *Algérien*, etc! A good periscope should be clear, strong with magnifying power at least one; those supplied are not clear and their power being less than one makes objects appear more distant than they are. Submarines have bent their periscopes in plunging, showing the weakness of these instruments.

EXERCISE AT RAISING A SUBMARINE.—On June 23 at 3 p. m., Admiral Cocheprat, prefet maritime of Brest, sent word out that a submarine had just sunk in 10 fathoms of water in the roadstead near ile Lougue. One-half hour later all the arsenal tugs with lifting chains, diving apparatus and crews were on the spot, ready for raising a vessel.

ACCIDENT ON "JULES-MICHELET."—During gunnery instruction firing on June 26 two flarebacks occurred. The first was in 6-inch turret No. 2, where at 3.40 p. m., at the 49th shot of a 6-inch gun, after an interruption in the firing of 3 to 4 minutes and succeeding a slow rate of firing of an average of 1 minute and 20 seconds between shots, the shell being in place for next shot, the two cartridge bags of the charge caught fire when inserted. The crew of the turret ran out with their clothes on fire. Three men died, and many others are badly hurt.

Reduced charges, made especially for schoolships, were in use.

The second happened under identical conditions about 6 p. m. the same date in 6-inch turret No. 6, where, after firing 113 shots, the very same accident as above took place. The mean interval of firing had here been 1 minute 43 seconds.

The powder belonged to a lot made at Saint Médard in 1910, and was above suspicion.

Gas expelling devices were fitted and working well, so the cause assigned is the heating of the gun.—*Moniteur de la Floite.*

The sailor men have but one opinion, *i. e.*, that the powder was bad.

NOTES ON THE ACCIDENT.—*Le Yacht* says that the powder used in the recent target practice was all in a condition of very doubtful stability emitting the odor of bananas. It was not put in the magazines until the very last minute, and every precaution taken to prevent a fire.

The powder used, however, is stated to have been delivered as having high stability, was BM_2 and AM_2 made at Saint Médard in 1910.

There were six men who died as a result of the accidents and 14 men were badly burned, and suffered the usual lung trouble.

We recall that the powder B is a mixture of two kinds of nitrocellulose.

Those interested in French powders may consult pages 1281 and 1282, of No. 140, for a description of their manufacture and composition.

The gas in guns might have been incompletely burned, due to the reduced charge. The block remained open. The gas had been blown out once by compressed air, and again after the shell had been seated.

Thus it is difficult to believe any gas remained, the chamber had been sponged, and the gun could not have been very warm.

The first section of charge was inserted, the loader with the second was coming up when the first was distinctly seen to take fire, slowly at first, then bursting into flames. There must then have been spontaneous decomposition and inflammation of the powder. Very fortunately the ammunition hoists are fitted with automatic shutters, for without these the flames would have spread and lighted other charges in the passing chambers.

The 8 per cent amyl alcohol is considered by Colonel Lepidi not as a stabilizer, but as a most satisfactory masker. In fact it might well be the agent which helped the ignition of the powder.

In consequence of the accident on the *Jules Michelet*, no firing will take place until further orders in which cartridge bags are used. The competitive firing of the fleet will therefore not take place after the maneuvers in July.

La Vie Maritime remarks relative to this disaster on the *Jules-Michelet* that MM. Delcassé and Millerand were astounded and shocked at the terrible accident. New and stable powders bursting spontaneously into flame like old and remixed ones! There is plenty here to wonder at as our official experts proclaim the excellence of our powders. The naval service and the powder makers no longer know what to think.

The Minister of Marine did at once what he ought to do: Ordered for immediate trial 5 tons English powder, 5 tons Italian powder, 5 tons Swedish powder.

THE OFFICIAL INVESTIGATION.—General Gaudin, head of this court, has reported the first results to M. Delcassé, and is to further investigate the central laboratory, those at Seivan-Livy, and at Gavres. From first examination of the powders we deduce:

1. The accident cannot be assigned to spontaneous ignition of the powder resulting from decomposition thereof. The powder is essentially one of high stability.

2. The ignition of the charge was not due to the high temperature of the powder chamber walls.

3. The place to look for the trouble is (a) in the solid residue of combustion, (b) in the inflammable gas produced by the combustion of the charge for the previous shot, which gas may not have been entirely driven out of the bore, (c) in the volatile matter given off normally by the powder and carried by the charges themselves under certain conditions.

Moniteur de la Flotte says that the last theory is the only possible one. Let us assume that amyl alcohol emits an inflammable gas. There will be in this event two compounds, nitrite of ammonium which explodes at 50°, and nitrite of amyl, susceptible of starting the fire at a low temperature in contact with water or air of high humidity. The serge of the cartridge bag was perhaps thoroughly soaked with volatile matter, and we see the probability of using in place of serge, a fusible metallic case proof against the amyl and ammonium nitrites.

It is perhaps worthy of remark that the powders designated for shore use have only 2 to 3 per cent of amyl alcohol, in place of the 8 per cent. This accounts for the few accidents with powder in the War Department.

THE FRENCH MANEUVERS.—The vessels sailed from Toulon at 2 p. m. on July 16 and comprised the following:

First squadron, 6 *Dantons.*

The second squadron, 5 *Patries,* 1 *Suffren.*

The light squadron, 2 *Waldeck-Rousseau,* 3 *Jules Ferry,* also the *Jurien de la Graviere* in place of *Ernest Renau.*

Five squadrons of destroyers.

One squadron of submarines.

In addition the torpedo-boats and submarines of the local defences of Toulon and Bizerta were engaged. The maneuvers took place between Toulon, Corsica, Bizerta, and Algeria. The *Foudre,* with her hydro-aeroplane, was also used.

The Mediterranean exercises began early on July 17. The whole force was in command of Admiral Lapeyrère who, last year, commanded one of the squadrons. M. Delcassé was on board the *Edgar-Quinet* and witnessed the whole of the operations.

The Red (enemy) fleet was supposed to be steaming for Corsica with the object of establishing a base thereon. Admiral Moreau, on the *Justice,* sailed from Bregançon with the second squadron and two torpedo flotillas forming the Red fleet. He reached Ajaccio at 4 p. m.

The commander of the Blue fleet had dispatched cruisers to the Hyères Islands, where, failing to find the Red fleet, he steamed to intercept it, the smoke of it being sighted more than ten miles in its rear. The cruisers could not stop the Red fleet on account of insufficient force, and the Red fleet anchored in the harbor of Ajaccio after overcoming the difficulties of a very deep harbor and the presence of some hostile destroyers which were driven off after an artillery duel. Admiral Moreau led his fleet out, all lights screened, during the night shortly after 11 p. m., in order to break the blockade established by the French fleet shortly after he had entered Ajaccio. The French destroyers on the blockade were found to be close in and a destroyer fight ensued. The squadron itself steamed out without meeting any large vessels, it having sent one of its destroyer flotillas to the attack of the French fleet. Admiral Moreau thus broke the blockade successfully. The Red fleet returning under radio instructions engaged in a running fight in parallel columns at 4 a. m. with the main French fleet. After its anchoring, the submarines attacked the Red fleet. Destroyers cruised outside the jetties and signalled the passage of the submarines to Admiral Moreau. They were usually detected in season by the wash of their periscopes, for the sea was calm.

On the afternoon of the 18th the Reds sailed and fought the French fleet led by Admiral Gauchet in the *Mirabeau* with six battleships and three cruisers. Steamed in parallel courses at 10,000 yards then closed to 8000, then to 6000, and the Red cruisers then attempted to T the French squadron, concentrating all fire on the flagship, which the destroyers attacked briskly, the opposing ones being too far ahead. The action then closed, and the combined fleets maneuvered at 16 knots for battleships and 20 knots for cruisers. During the night torpedo attacks were repelled.

On the 19th the fleet was again divided as formerly, Blue under Admiral Bellue, composed of first squadron, first cruiser division, first, second and fourth torpedo flotillas; Red, under Admiral Moreau, composed of second squadron, second cruiser division, and third and fifth torpedo flotillas. The Red fleet steamed to north, the Blue to the south. When the Red sighted the Blue, the Red was steaming in line of sections, and the Blue was distant about 15,000 yards. At 8000 yards the Red changed course 8 points to starboard by section thus allowing all his heavy guns to bear. The Blue at this time can use but the guns of its first four vessels, the others using after guns only. The range closed continuously. The flotillas of the Blue fleet are too near the Red and are beaten by the heavy fire of the Red

fleet which found itself more and more massed on the head of the Blue column. The battle takes a very favorable turn for the Red which gained the initial tactical advantage. Here happened the final incident which gave the Red the battle. Suddenly the second cruiser division left the column and by a wide turn to port attacked the rear of the battleships of the first squadron. The moment was bad for the latter, she is about to be beaten in front by the battleships of the Red, and will undergo a fire from astern by the cruisers. The Blue makes an error and detaches the two rear battleships to engage the attack of the cruisers. While thus reduced to four, the Blue finds that it cannot sustain the attack of the six Red battleships. The cruiser division of the Blue in head of column appeared to do nothing but prolong the line. The artillery fight thus took 35 minutes, resulting in a victory for Admiral Moreau in the Red fleet.

The fleet then proceeded to Algiers and Bizerta. Several engagements in tactics occupied the remaining days. The signals most favored for battle were "cruisers T the enemy," "destroyers charge the head of the column." Again the utility of movements by sections by which the Red in a former engagement had obtained the advantage was brought to light. The advantages of having fast wings simulated here by destroyers were brought out strikingly, and the French press deems there is a need for the battle-cruiser and for the 5000-ton fast cruisers which can disperse the torpedo flotillas while scouting. The *Foudre*, with its aeroplane, was brought in use the last two days, though it is not mentioned in detail by the press. These maneuvers continued for one week.

GERMANY.

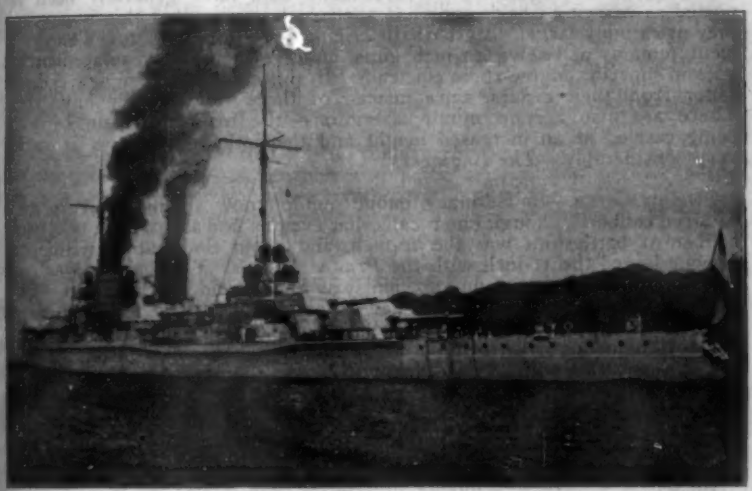
VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks.
Battleships					
Oldenburg	22,400	21	12 12-in., 14 5.9-in.	Dantzig (Schichau)	Commissioned
Kaiser	24,500	21	10 12-in., 14 5.9-in.	Kiel (Kaiserliche)	Launched Mar. 22, 1912
Friedrich der Grosse	24,500	21	same	Hamburg (Vulkan)	" June 10, 1911
Kaiserin	24,500	21	same	Kiel (Howaldt)	" Nov. 11, 1911
Prince Regent Leopold	24,500	21	same	Germania Works	" Feb. 21, 1912
König Albert	24,500	21	same	Danzig (Schichau)	" April 27, 191.
Ersatz K. F'd'h Wilhelm	27,000	21	10 14-in. (probably)	Hamburg	Laid down Nov., 1911
Ersatz Weissenburg	27,000	21	same	Bremen	" " Nov., 1911
Ersatz "S"	27,000	21	same	Wilhelmshaven	" " July, 1911
" "A"	27,000	21	No details	Germania	Projected
Battle-Cruisers or Cruisers of the Line					
Goeben	22,600	27	10 11-in., 12 3.4-in.	Hamburg	Commissioned
Seydlitz	22,600	27	same	"	Launched Mar. 30, 1912
"K"	....	..	(?)	"	Laid down June, 1911
Ersatz Kaiserin Augusta	....	..	(?)	Dantzig	Authorized
Protected Cruisers					
Breslau	5,000	29	2 5.9-in., 10 4.1-in.	Stettin	Launched May 16, 1911
Magdeburg	5,000	29	same	Bremen	" May 13, 1911
Stralsund	5,000	29	same	"	" Nov. 4, 1911
Ersatz Strassburg	5,000	..	....	Wilhelmshaven	" Aug. 24, 1911
Ersatz Seeadl'r	5,000	..	....	Germania	Building.
" Seier	5,000	..	....	Howaldt	"

"KAISER" CLASS.—The increase of size in this class over the *Oldenburg* type is devoted to increasing the steaming radius entirely.

BATTLE-CRUISERS.—The official name given these cruisers in Germany is Linienschiff Krewzer or cruisers of the line.

SPEEDS OF MEN-OF-WAR.—Battle-cruiser *Goeben*. In her first steaming trials just completed a maximum speed of more than 30 knots was reached. This places her as the speediest German man-of-war with the exception of destroyers and the small cruiser *Breslau*. The speed of the English battle-cruiser *Lion*, as finally corrected, was 28 to 28.7 knots; that of the *Moltke* was 29.5 knots maximum and 28.4 knots since her commissioning. The *Breslau*, on April 20, 1912, made 30.4 knots. The *Von der Tann* made a maximum of 28.1 knots. The torpedo vessel *G-194* made 36 knots in September, 1911. The battle-cruisers of Germany were all built by Blohm & Voss, of Hamburg, and are all fitted with Parsons' turbines. The small



BATTLE-CRUISER "GOEBEN."

cruiser *Breslau* has turbines of type A. E. G., and the torpedo vessel *G-194* has turbines of type *Germania*. The *Goeben* is now undergoing her official acceptance trials.—*Internationale Revue*.

According to reliable reports the German cruiser *Moltke* never achieved the record speeds attributed to her by the daily press. She is good for 27 knots, but has never exceeded that to any extent. It is also stated that as a steamer she is behind the *Von der Tann*, which ship, by the way, never did so well, relatively speaking, as the *Blücher*. The *Blücher* appears to be one of the most successful ships ever built. Her armament is nothing much, but it needs an *Indomitable* to defeat her. She is not very appreciably slower, and she cost about half as much as *Dreadnought* cruisers do. On paper she makes but a poor show—but paper superiorities have a knack of disappearing into the *ewigkeit* what time stern practice is the only criterion.—*The Engineer*.

SPEED OF "OLDENBURG."—*Oldenburg* made 22.2 knots on trial near Dantzig.

The Germans announce that the battle-cruiser *Goeben*, sister to the *Moltke*, has made a speed of 30.5 knots, which is thus the record for large vessels. Some doubts are held as to this. The Germans do not admit it willingly, but the *Lion* made 31.7 knots upon at least one of her runs, and we are not at all sure after her alterations but that she will again make a speed over 31 knots.—*Le Yacht.*

"GOEBEN."—Turbine battle-cruiser *Goeben*, off Cuxhaven on May 18, made 30.5 knots an hour over a measured course. This vessel has Parsons' turbines. The dimensions of this vessel are now given as follows:

Length, 609.08 feet; beam, 96.76 feet; draft, 26.9 feet; displacement, 23,000 tons; horse-power, 52,000; designed speed, 28 knots; coal capacity, 3100 tons; boilers, 24; crew, 1013; armament, ten 11-inch 50-caliber, twelve 6-inch 45-caliber, 4 submerged torpedo tubes.

The new German cruisers of the *Breslau* class—*Breslau*, *Strassburg*, *Stralsund*, and *Magdeburg*—of 4700 tons odd, have generally been reported as carrying 6-inch guns. It appears, however, that this is not so—they are simply larger sisters of their immediate predecessors. The armament remains at twelve 4.1-inch guns, and the increased displacement all goes in superior engine-room efficiency. In this connection the new cruisers differ from their sisters, since instead of three funnels they have four. There are also certain minor alterations—the aftermost pair of guns being carried at an increased height and the form of the bow is varied very considerably.—*The Engineer.*

SIZE OF GUNS.—In Germany public opinion now strongly favors guns of large caliber. Though one recalls that even as late as 1901 the maximum caliber of battleships was the 10-inch, and about that date the Imperial Navy adopted the 11-inch with the *Braunschweigs*. This caliber was used for the *Nassaus*, started in 1907, and was only abandoned in favor of the 12-inch with the *Helgolands*. That caliber was retained in the *Kaisers*. The public press, and Count Reventlou reproach Admiral Von Tirpitz for not immediately conforming to the English when, in 1909, they adopted the 13.5-inch gun, and for not having pushed the construction of the 12-inch guns with sufficient energy to the end that the *Nassaus* could have had them. —*Le Yacht.*

COALING RECORDS.—Recently it was stated that the *Helgoland* had loaded 1100 tons of coal in two hours.

For many months certain statements have appeared in the German press regarding the rapidity with which German battleships are coaled. Certainly records of 500 and 600 tons per hour are most creditable and indicate a high state of efficiency as far as the coaling party is concerned. But for practical purposes it must be remembered that most of this coaling is done in bags sent alongside, already filled, from the shore, and with the assistance of practiced coaling gangs. There is no filling of bags in a collier's hold and subsequently transporting them with a Temperley transporter, which is all done, incidentally, by the ship's company only in the Royal Navy. The dockyard coaling system in Germany is brought to a fine standard; in war time it will devolve on the ship's company to take in what coal they can get wherever possible, and these records probably represent three times what could then be done.—*The Engineer.*

THE GERMAN NAVY.—The German new construction program for the next six years comes out as follows: 1912 (two ships): Battleship in replacement of the *Brandenburg*, and large cruiser to be known at present as the *L*. 1913 (three ships): Augmentation on additional battleship, battleship in replacement of the *Wœrth*, and large cruiser in replacement of the *Hertha*. 1914 (two ships): Battleship in replacement of the cruiser *Kaiser Friedrich III*, and large cruiser in replacement of the *Victoria Luise*.

1915 (two ships): Battleship in replacement of the cruiser *Kaiser Wilhelm II*, and large cruiser in replacement of the *Freya*. 1916 (three ships): Augmentation on additional battleship, battleship in replacement of the *Kaiser Wilhelm der Grosse*, and large cruiser in replacement of the *Hansa*. 1917 (two ships): Battleship in replacement of the *Kaiser Barbarossa*, and large cruiser in replacement of the *Vineta*. A second flotilla of submarines will be brought into service in the autumn; this will bring the number of these small vessels owned by Germany to twenty-four. A third flotilla of twelve submarines is in contemplation.—*Engineering*.

It is to be noted that in the above program many of the new ships are far greater in power than those which they replace.

All new German construction awarded this year went to the Baltic yards. The *Ersatz Brandenburg* to Germania works at Kiel.

The armored cruiser *Kaiserin Augusta* to the shipyard Schichau at Dantzig. Of the smaller units the imperial dockyard of Kiel will build the cruiser *Ersatz Prince Wilhelm*, and Vulcan works of Stettin the cruiser *Ersatz Irene*. Twelve destroyers will be built at Schichau, and six submarines at Germania works at Kiel.—*Internationale Revue*.

NEW DOCKYARD.—A dockyard will be established at Cuxhaven to afford accommodation for vessels of the largest size. At present it is made use of only for those vessels which cannot be berthed at Wilhelmshaven.

BUDGET.—This provides that in 1914 the army will consist of 688,100 men, who are divided into 544,200 men and petty officers, and 97,600 under officers, 13,200 one-year volunteers, and 33,100 higher and general officers. The fleet will comprise 80,000 sailors, petty officers, and officers.—*La Vie Maritime*.

GERMAN MANEUVERS.—The spring maneuvers of the high sea fleet lasted about six weeks. Few details are available. The fleet was composed of 16 battleships, four armored cruisers (*York, Blucher, Von der Tann* and *Moltke*), five smaller cruisers, four destroyer flotillas, one submarine flotilla, and two divisions of mine layers.

A first series of exercises took place in the North Sea, and a second on the coast of Denmark off Skagen, after which the second squadron went to Wilhelmshaven and simulated a landing at the mouth of the Ems. The troops stationed at the isle of Borkum, which commands the Ems, were warned of the landing while away at target practice. They reached the port of Emden by forced marches, all the steam vessels were seized and they embarked. Steamers came from the islands of Sylb and Helgoland with marine artillery. The troops were disembarked and the island successfully defended.

ACCIDENTS.—The collision of torpedo-boat *G-113* with the battleship-cruiser *Friedrich Karl* happened during the night in maneuvers. The blow was so violent that the bow of the torpedo-boat for a length of seven feet was completely folded back. The cruiser sustained negligible injuries. As for the boat her hull was not torn as the fold, and she was able to gain Kiel without making water, and from there to return under its own steam to the Wilhelmshaven shipyard where she is going to be repaired. Although the injury was very great, the German steel used in the construction of torpedo vessels as in battleships has proved to be of a great resistance and of remarkable tensile strength. The steel was not ruptured. The collision occurred in the exercise of running a channel by the torpedo-boats. This maneuver, of which the details are held secret in the interests of national defence, puts a strong test on the quality of the matériel and on the skill of the crew. It is the more difficult because, in night attacks, the torpedo-boats, as well as the enemy's vessels, navigate with all lights out. The German torpedo-boats enjoy a justly earned reputation for being a strong

arm, and hence it is necessary that they occasionally pay the cost necessary to keep this reputation.—*Ueber die Gesamten Armeen und Flotten.*

One of the small boats belonging to the German battleship *Thüringen*, which was anchored with the rest of the second squadron of the active fleet in the Kurisches Haff, capsized July 22 while it was taking officers back to the vessel from shore, two officers being drowned. Eight others were brought ashore unconscious, but were resuscitated. Another pinnace loaded with bluejackets belonging to the fleet also was wrecked in the surf, but all were saved.

The German battleship *Hessen* rammed a torpedo-boat while the smaller craft was crossing the bows of the big warship during a night attack off Kiel July 19. Three members of the torpedo-boat's crew were killed. The damaged vessel was towed to Kiel harbor for repairs.—*Army and Navy Journal.*

GREAT BRITAIN

VESSELS BUILDING

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Thunderer	22,500	21	10 13-5-in., 16 4-in.	Thames Iron Works	Commissioned June, 1912
Conqueror.....	22,500	21	same	Beardmore	" Sept., 1912
Ajax.....	23,500	21	same	Scott (Greenock)	Launched March 21, 1912
Audacious.....	24,000	21	same	Cammel Laird (Birkenhead)	Building
Centurion.....	24,000	21	same	Devonport	Launched Nov. 18, 1911
King George V	24,000	21	same	Portsmouth	" Oct. 9, 1911
Benbow	26,000	22	10 13-5-in., 16 6-in.	Beardmore	Laid down May 30, 1912
Delhi.....	26,000	22	same	Vickers	" May 31, 1912
Iron Duke.....	26,000	22	same	Portsmouth	Building
Marlborough..	26,000	22	same	Devonport	Building
Battle Cruisers					
Princess Royal	27,500	28	8 13-5-in., 16 4-in.	Vickers	Undergoing trials
Queen Mary...	28,850	28	same	Palmer	Launched March 20, 1912
Tiger.....	28,850	30	same	Brown & Co.	Building
Australia.....	18,750	25	8 12-in., 16 4-in.	"	Launched Oct. 25, 1911
New Zealand..	18,750	25	same	Fairfield	" July 1, 1911
Protected Cruisers					
Chatham	5,500	25.5	8 6-in.	Chatham	Launched Nov. 9, 1911
Southampton..	5,500	25.5	same	Brown & Co.	Building
Dublin	5,500	25.5	same	Beardmore	Launched Apr. 30, 1912

TRIALS OF BATTLE-CRUISER.—The battle-cruiser *Princess Royal*, built by Messrs. Vickers, Son & Maxim, will leave Barrow for Devonport on July 16, carrying out preliminary and anchor trials on the passage. After being docked her gun and torpedo trials will take place on September 6 and 7; on September 9 her twenty-fours hours steam trial with runs on the Polperro mile course will be carried out, and on September 12 her full power and other trials. She will then be docked again, and on September 21 off Polperro she will run mile trials at three-quarters and full power.—*United Service Gazette.*

THE "PRINCESS ROYAL."—Captain Osmond De B. Brock, Assistant Director of the Mobilization Division of the Admiralty War Staff, will, on August 1, take over the command of the new battle-cruiser *Princess Royal*, which has been built by Messrs. Vickers, Limited, at Barrow-in-Furness, and will be ready shortly to carry out her official steam trials. The *Princess*

Royal was laid down at Barrow on May 2, 1910, and is a sister ship to the battle-cruiser *Lion*, flagship of the first cruiser squadron. She has been built with a length of 660 feet, and a displacement of 26,350 tons, whilst her turbines are of 70,000 horse-power, estimated to propel her at a speed of 28 knots. The *Princess Royal* would have carried out her trials in May last, but has been delayed for alterations to be made in her similar to those made in the battle-cruiser *Lion*. The cost of the *Princess Royal* will exceed two millions sterling.—*United Service Gazette.*

H. M. S. "CONQUEROR."—The latest of the British battleships so far constructed—the *Conqueror*—has completed her steam trials, and these have yielded most satisfactory results. The speed attained on the full-power trials on the measured runs exceeded the rate achieved by any *Dreadnought* battleship in the British Navy, and, indeed, any battleship of the same fighting power in any foreign country. The *Conqueror* on her trials attained a mean speed of 22.126 knots, whereas the sister ship—the *Thunderer*—got 20.08 knots; the *Monarch*, 21.88 knots; and the *Orion*, 21.02 knots. The speed aimed at in these various ships was 21 knots, but the propellers are different, and there is a reserve of steam power to meet contingencies in service. In the case of the *Conqueror* the vessel was run for a short time, when at sea, at a power considerably in excess of that required by the contract. The designed power of the machinery was 27,000 shaft horse-power, and on the eight hours trial the actual mean was 28,430 shaft horse-power, the two starboard turbines developing 14,380 shaft horse-power, and the two port turbines 14,050 shaft horse-power, the mean revolutions of all four shafts being 322 revolutions per minute. The steam pressure at the boilers was 230 pounds, and at the engines 217 pounds, the vacuum being 28.3 inches, with a barometer reading of 29.82 inches. The coal consumption throughout the trial was 1.74 pound, which is very satisfactory. During this trial six runs were made over the measured course at Polperro, and on these runs the machinery worked with marvellous regularity, the variations in the mean revolutions of the turbines being between 338 and 340.5 revolutions per minute. The speed attained varied very little, the rate in these six successive runs being 22.962 knots, 22.109, 22.133, 22.133, 22.133, and 22.109, giving a mean speed of 22.126 knots, which, as we have said, is the highest speed in any ship of the class to which the *Conqueror* belongs.

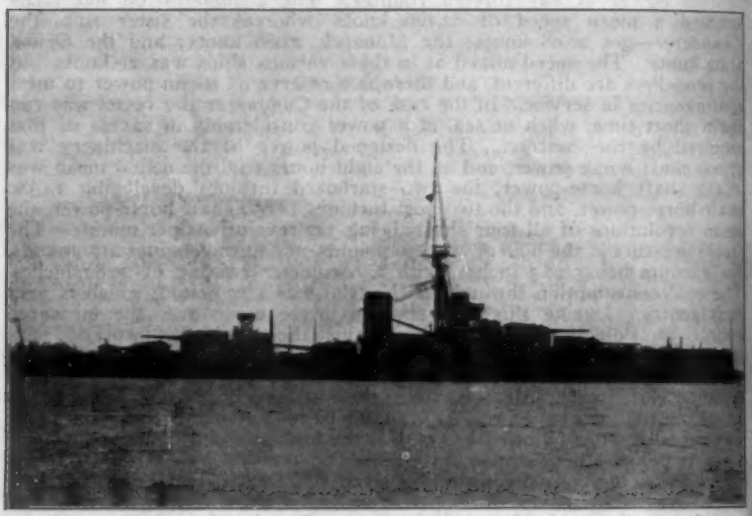
On the 30 hours coal consumption trial equally satisfactory results were got. The mean power developed was 19,081 shaft horse-power, almost exactly equally divided between the two starboard and the two port shafts. The boiler pressure was 226 pounds, the vacuum 28.6 inches, with a barometric reading of 29.57 inches, while the coal consumption was notably low. Six runs were also made on this trial, and the mean speed was 19.36 knots. Equally with this and the full-power trial the ship was loaded to her service draft, and the stokeholds were under practically natural draft conditions, no difficulty being experienced in maintaining full steam pressure. So there is no doubt that, so far as the design is concerned, the machinery is highly satisfactory.

There are eighteen boilers in the ship, of the Babcock & Wilcox type, and the ratio of heating surface to grate area of 35 : 1, while 2¼ square feet of heating surface is provided per unit of power. The turbines are of the Parsons' type, mounted on four shafts, there being two high-pressure ahead turbines and two low-pressure ahead turbines, while the astern turbines are also arranged similarly in series, there being two high-pressure and two low-pressure. But whereas the high-pressure ahead and astern turbines are in separate casings, the low-pressure ahead and astern turbines are, in each instance, arranged in one casing.

The *Conqueror*, which is of 22,500 tons displacement at a draft of 27 feet 6 inches, has a length between perpendiculars of 545 feet, a beam of 88 feet 6 inches, and a depth moulded of 43 feet 6 inches. The ship is fitted with ten 13.5-inch breech-loading guns, placed in pairs in barbettes, so arranged on

the center line that all five can be fired on every broadside, and that, in addition, there is an auxiliary armament having a combination of 6-inch and 4-inch guns. The *Conqueror* has been built and engined by Messrs. William Beardmore & Co., the keel having been laid on April 5, 1910, but the construction has been delayed owing to labor troubles. The firm are to be congratulated on the success of the performances of the ship and well merit the confidence shown by the Admiralty in placing with them the order for the battleship *Benbow*, provided for under the program of 1911-12.—*Engineering.*

The British battleship *Conqueror*, on the eight-hour trial at full power June 7, made a speed of 23.25 knots instead of the 21 knots as stipulated in the contract. The fastest British battleship hitherto was the *Vanguard*,



BRITISH BATTLESHIP "CONQUEROR."

which did 22.1 knots on her trial two years ago. The fastest German battleship is the *Oldenburg*, which attained a speed of 22.4 knots.—*Shipping*, Illustrated.

"CENTURION" (BATTLESHIP), BUILDING AT DEVONPORT.—The armor plating for the conning-towers has been delivered. The foremost tower will be of an enlarged pattern, so constructed as to serve as a fire-control and Whitehead observation station, and the after one, of smaller dimensions, will serve as an observation and Whitehead control station for the stern fire. The grouping of the forward armor forms a combination of exceptional strength, and presents either inclined or curved surfaces to practically all angles of fire, the center of the combination being occupied by the 13.5-inch barbette redoubt.—*Army and Navy Gazette.*

In the *Centurion* an armored battery and a super-imposed armored casemate is to be introduced for the auxiliary armament. The positions of the masts will have to be changed and a reversion to single masts is expected, as is evidenced in the *Lion.*

NEW TYPE OF GUN.—The first keel plate of the battleship *Delhi* was laid in July at Vickers' naval construction works at Barrow. She will represent the latest super-*Dreadnought* type and will have the newest 13.5-inch guns, throwing shells of 1400 pounds, against 1250 pounds of the old 13.5-inch guns, and equal to the latest 14-inch gun of the American Navy. She will also have sixteen 6-inch guns and many smaller ones with long range. Her speed will be twenty-two to twenty-three knots.—*United Service Gazette.*

ANTI-ROLLING TANKS.—The *Centurion* will have these as well as large bilge keels. The *King George V* has had them fitted and the *Iron Duke* is to have one of the Frahm type similar to those of the Cunarder *Laconia.* These tanks consist of a floating tank in an outer tank. The principle of the method being that of attaching a second pendulum to a swinging pendulum at its bulb and then a third pendulum to the bulb of the second pendulum. The motion of the first pendulum is conceived to be that of the waves of the sea, the second pendulum is that of the tank free to float inside the ship and the ship itself becomes the third pendulum and no rolling is transmitted to the ship in any sea.

BATTLE-CRUISER "LION."—The alterations that were necessitated by the heat from the foremost funnel having been found so great in the course

BATTLE-CRUISER "LION" BEFORE RECONSTRUCTION.

of the first official steam trials than when all the boilers were in use it twisted some of the fittings on the navigating bridge, warped the woodwork, generally made the conditions unbearable for those on duty there, and the heat from the funnel seriously affected the ship's compasses and other delicate instruments on the bridge and in the fire-control platform which forms part of the tripod mast, were completed and the vessel commissioned June 4 for service in the first cruiser squadron. She now, as is seen from the illustrations, has pole masts and the largest and longest funnel of any battle-cruiser. The fire-control gear is housed in the conning-tower.

She is the first finished English warship to cost over two millions sterling. The total expenditure has been £2,057,708 or $10,000,460.

She is the largest completed warship in the world, being 50 feet longer than the German battle-cruiser *Goeben,* and 3800 tons heavier than the British battleship *Orion.* Her actual dimensions are: Length, 660 feet; beam, 88.5 feet; normal draft, 28 feet; displacement, 26,350 tons. Her Parsons' turbines are of 70,000 horse-power, designed for a speed of 28 knots.

The *Lion* is the first cruiser to be completed armed with the 13.5-inch gun. Eight of these weapons are mounted in four turrets on the center line, the second from forward being raised to fire over the foremost. Four guns thus bear ahead, two astern, and eight on either broadside. Two 21-inch torpedo tubes are fitted, and sixteen 4-inch guns are mounted for keeping off torpedo craft. The main armor belt is 9 inches thick amidships.

THE RECONSTRUCTED "LION."—No one has a favorable word to say of the battle-cruiser *Lion's* appearance, now that she is again at sea, writes a naval correspondent of *The Globe*. Originally she was characterised by one expert as "the ugliest vessel in the British Navy," but in point of comparison she was handsome six months ago to what she is now, with the foremost and center funnels much closer together than the center and after funnels, the two pole masts (there is no tripod) disposed unlike anything to which the eye is accustomed, and the conning-tower enlarged so much that it detracts from the few graceful lines which the vessel originally possessed. The only redeeming feature about the alterations, so far as they relate to the appearance of the *Lion*, is that the three funnels are symmetrical; instead of the foremost one being almost oblong, it is now oval, and the other two, which were stumpy, have been raised to a height uniform with the new one. How the modifications will answer remains to be proved during the forthcoming maneuvers; but one thing which is certain is that the "spotter" will not run the risk of being suffocated by the control position being placed, as it formerly was, abaft the foremost funnel. The mast which carries the control platform is now before the funnel, where in most conditions of weather it will escape the fumes from the up-

BATTLE-CRUISER "LION" AFTER RECONSTRUCTION.

takes. The alterations to the *Lion* and her two sister ships are estimated to cost quite £70,000, and will be a charge upon the supplementary estimates. —*Page's Weekly*.

H. M. AUSTRALIAN CRUISER "MELBOURNE."—The launch of the cruiser *Melbourne* at Cammell, Laird & Co.'s works at Birkenhead has special significance, as it marks a new and definite naval policy undertaken by one of the Dominions of the Crown. The new Australian Navy, of which the *Melbourne* will form part, will comprise modern cruisers, torpedo-boats, and submarines. It will further necessitate the maintenance by this colony of training establishments, dockyards, and factories. The *Melbourne* was designed by Sir Philip Watts, Chief Constructor of the Navy, is 456 feet 10 inches long overall, 430 feet between perpendiculars, and 49 feet 10 inches in breadth, and her displacement at load draft is about 5600 tons. She will carry eight 6-inch guns, two broadside torpedo tubes, and will have a storage capacity for seven torpedoes. Protection is afforded to the water-line and the hull above this line by an armor belt extending the whole length of the ship. The thickness of this belt is 2 inches amidships. Further protection of the vital machinery is afforded by the coal bunkers. The inner bottom is continuous throughout the magazine, machinery and shell room spaces, and the hull is divided transversely and longitudinally with water-tight bulkheads.

The vessel will be propelled by steam turbines of the Parsons' type, arranged to drive four shafts, each of the shafts being available for going either ahead or astern. The designed revolutions when the machinery is developing full power will be about 500 per minute. The condensers are of the Uniflux type, and are designed for the high vacua necessary with turbine machinery. The water-tube boilers are of the three-drum small tube type, the tubes being 1⅛-inch and 1⅜-inch diameter. The boilers are primarily intended for burning coal, but special arrangements have been made to enable oil fuel to be burned in conjunction with coal when this is necessary. Many improvements have been made in the machinery as a result of the experience which has been gained in previous vessels of the class. The whole of the steel forgings in connection with the turbine machinery have been manufactured at the shipbuilders' steel works at Sheffield.

The ship is electrically lighted throughout internally by incandescent lamps, and arc lamps for use when coaling have been provided. For coaling purposes two electrically driven coaling winches will be used. They are capable of lifting one ton to a height of 40 feet at speeds varying from 75 feet to 200 feet per minute. The ammunition hoists, the ash hoists, and the after capstan are all electrically driven. The forward capstan placed on forecastle deck can be worked by steam or hand. The officers are berthed aft on the lower deck and on the starboard side of the upper deck. The crew occupy the forward portions of these decks. Ten electrically driven 12½-inch fans will supply air to the magazines, shell rooms, steering compartment, engineers' workshop, and working spaces beneath the lower deck, and also to the cabin and crew spaces, etc. The engine rooms will be closed down for action and ventilated entirely by 20-inch and 25-inch electric fans.

Electrically driven reciprocating pumps with auxiliary hand gear for drawing water from the sea and delivering it to a sanitary tank, also for the distribution of fresh water to the various apartments, are part of the equipment. The steering gear, which is of the screw pattern, is worked by steam or hand, and is controlled from the bridge by telemotor gear. The wireless telegraphy installation is according to the latest Admiralty requirements. There are four searchlights placed in suitable positions and a comprehensive arrangement of voice pipes, telegraphs, and telephones. The ship will be manned by about 400 officers and men.

NEW ZEALAND PRESENTS A BATTLE-CRUISER.—The Admiralty announce that they have recently been in communication with the government of the Dominion of New Zealand upon the employment of the battle-cruiser which is now building at the charge of the Dominion for presentation to the Royal Navy. It had been intended that this vessel should be stationed in the Far East, but the government of New Zealand have, in response to Admiralty inquiries and suggestions, expressed their wish that the Admiralty should employ this vessel wherever her services can be most useful. His Majesty's Government have gratefully accepted this intimation. As the British squadron on the China Station has recently been reinforced by the *Defence*, the Admiralty have decided that the battle-cruiser *New Zealand* can best at present be employed in home waters. She will accordingly, as soon as she is completed, visit the Dominion of New Zealand, probably in the early part of next year, after which she will join the first cruiser squadron in the first fleet, which her arrival will complete to its full strength of five ships.

The Dominion of New Zealand has, by this latest act, set her seal to the Imperial ideal—one Empire, one flag, one fleet. Her decision is of the greatest significance and promise, and the announcement is made at a peculiarly suitable moment. The standard of naval strength of the European naval powers is rapidly rising, and the burden upon the British taxpayer is increasing, and with a devotion which the British people will realize and acknowledge in fitting terms, the smallest of the self-governing

Dominions makes her offering to the common cause—the protection of the interests of all the Britains. It should be added that towards the general expenses of the navy New Zealand is also contributing £100,000 annually. In proportion to her wealth and population she is giving more to the naval defence of the Empire than any section thereof, and by her latest act has set a new and splendid example of devotion to the larger policy—the policy of future generations.—*United Service Gazette.*

H. M. S. *Firedrake*, one of the three special destroyers ordered by the Admiralty last year from Messrs. Yarrow & Co., of Glasgow, had a successful official full-speed trial on Saturday, June 29, on the Skelmorlie deep water measured mile at the mouth of the Clyde, attaining during a continuous run of eight hours a mean speed of 33.17 knots, thus exceeding the contract speed of 32 knots by 1.17 knots.

The vessel is 255 feet long by 25 feet 7 inches beam, and is propelled by Parsons' turbines driving two shafts, steam being supplied by three Yarrow water-tube boilers fitted with the firm's latest feed-heating devices.

Superheating, which has been introduced throughout stationary engines and to a large extent in locomotive practice, owing to the success of the *Archer* and *Attack*, will undoubtedly become universal in marine practice, as there is an undoubted gain of 10 per cent. By superheating, the condensation of the steam in its passage through the turbine is materially reduced, and when cruising entirely avoidable.

A MINE-LAYING SQUADRON.—Every credit should be given to the authorities for the way many of the *Naiad* and *Apollo* class of second-class cruisers have been rescued from those stepping stones to the scrap heap, the Mother Bank and outpost moorings—and fitted up for a further period of service with the fleet as mine layers. It has taken some time to complete an efficient squadron of mine layers in this way, but the British Navy now possesses such a squadron, and one which has no equal in the world. These ships are under the command of specialists, and are frequently exercised at the sort of work they would be called upon to perform in time of war; while they have recently completed a program which was a searching test of their efficiency for these functions. The test was got through successfully and with credit to all concerned. The vessels have been fitted up at the Royal dockyards as secretly as is possible in these days of many spies and informers, and it is believed that the Admiralty have succeeded in keeping essential knowledge of their equipment from those who are anxious to discover it; it is certain from the facility with which long lines of blockading mines are run that the plan adopted for dropping them is quite reliable. In fairly shallow water, when blockading an enemy's ports or defending our own, such a squadron of mine layers will be of the utmost utility to an admiral, especially when manned by crews who have become experts by constant practice in handling them and the intricate machinery with which the mines are well and truly sown along the exact channel it is intended they should be dropped.—*United Service Gazette.*

SUBMARINES.—Submarine *A3* was towed into West Bay, and when some miles off Portland she was fired at by the battleship *St. Vincent*, which, at a range of 200 yards, struck her with the third shot and sent her to the bottom.

Submarine *E5* was launched from Messrs. Vickers' works at Barrow recently. She is of the latest type, and will be fitted with disappearing quick-firing guns and wireless telegraphy apparatus.

The lifting powers of the new floating dock for destroyers at Harwich are to be tested by the docking of the *Ghurka* and *Mohawk*, whose united displacement is 1735 tons. The dock was designed to lift 2000 tons.—*Army and Navy Gazette.*

COALING.—At Portland on May 13 the *average* coaling of the two first squadrons of battleships was 301 tons per hour. These squadrons comprise the 13 *Dreadnoughts* and two *Lord Nelsons.*—*Le Yacht.*

THE ADDITION TO THE NAVY ESTIMATES.—Mr. Winston Churchill once more gave proof of the determination which he has consistently shown to maintain our supremacy on the principle that it is easiest to ensure peace by being thoroughly prepared for war. When the Navy Estimates of the year were issued, it was stated that they had been framed "on the assumption that the existing programs of other naval powers would not be increased," and that "in the event of any such increases it will be necessary to present supplementary estimates both for men and money." Germany is adding to the provisions of her naval law the amending bill providing for the construction of three additional battleships during the next three years, as well as for the laying down of more small cruisers and submarines; at the same time, in order to add to the number of ships continuously in commission in the North Sea, 15,000 officers and men are to be added to the personnel. The bill providing for these additions only passed its second reading in the Reichstag on a Tuesday evening. Mr. Winston Churchill, in the House of Commons, on Wednesday, announced that he would present supplementary estimates to provide for the increase promised in view of such contingency as has now arisen by the action of the German naval authorities. No information, of course, is yet available as to the extent of the increase decided upon by the First Lord of the Admiralty; but it may be remembered that in introducing the estimates in March, Mr. Winston Churchill stated that the standard of naval strength aimed at by the British Admiralty was a standard of 60 per cent in excess of the then existing German naval law, so that during the next six years from now we should lay down per annum four ships and three ships alternately, beginning with four this year; this, he stated, "is the least that will maintain the 60 per cent standard." He made it clear, however, that any single additional ship added, say, by Germany, would be met by two additional ships laid down by Britain. As Germany has decided to lay down three additional ships during the next three years, obviously the British Admiralty must lay down six ships during the same period. Consequently the program of the next three years ought to be not four, three, and four ships, but six, five and six ships in the respective years. At the same time, additions must be made to the personnel. It is needless to say that the country has shown ready an almost universal approval of the First Lord's statement. The effect of this announcement was augmented by a speech at the dinner of the Worshipful Company of Shipwrights, when he stated that "although the additional estimates will not be so large as some would hope and others would fear," His Majesty's Government would be able to convince the House of Commons that what they asked for was both necessary and sufficient. He expressed the widely entertained satisfaction that, while we have several parties in the state, we have only one navy, which is the care of all parties. Another point in his statesmanlike speech was the announcement that the Third Sea Lord, who is the officer of the Admiralty charged with the care of the great province of matériel, would be relieved of all unnecessary departmental work, so that he might have leisure for reflection and for study, and freedom to move about frequently in the sea-going fleets. This idea of closer contact between the executive officers of the Admiralty and the fleet is further ensured by the unusual procedure now decided upon, that Vice-Admiral Prince Louis of Battenberg, one of the Lords Commissioners, will command a fleet during the maneuvers, which are to be carried out on an exceptionally large scale towards the end of July. Brief reference should also be made here to the development in naval policy which was enunciated by Mr. Winston Churchill, whereby the fleet would be concentrated more in home waters. As a consequence of the restriction in world-wide mobility involved by this, the plea was put forward that sooner,

rather than later, naval responsibility must be shared by the colonists, to this extent: that while the mother country maintained the Empire's sea supremacy in the decisive theater of European waters, the daughter states might undertake the control and guarding of the rest of the Empire.—*Engineering.*

The Admiralty announce a further important step in connection with the new organization of the fleet, which was explained by the First Lord in his speech introducing the Navy Estimates. The changes will be effected in the course of the next month, and when they are completed, six battle squadrons will be homogeneous. The first and second will consist of the *Dreadnoughts* and the *Lord Nelsons.* The third squadron (ex-Atlantic) will be newly formed of the eight *King Edward VII* class. In the course of the summer the present Mediterranean battle squadron will be based on Gibraltar and formed into the fourth battle squadron, and consist at the outset of the *Duncan* class. All these four squadrons will be in full commission and will form the first fleet. The fifth battle squadron, hitherto known as the third division (nucleus crew ships), will consist of the eight ships of the *Formidable* class. The seventh battle squadron (third fleet) will comprise eight *Majestics,* and it is to this squadron that the new immediate reserve will be attached. The two battleships of the *Swiftsure* class, now in the Mediterranean, will pass into the third fleet. It will not be necessary to complete the sixth or to form the eighth squadron at present. It is intended that the first, second, third, fourth, fifth, and seventh squadrons should take part in the maneuvers in July as regular tactical units.—*United Service Gazette,* May 9.

The Admiralty have decided upon the construction of a third graving dock at Rosyth naval base, at a cost of £250,000. This additional dock, which will be 900 feet long, will occupy the most easterly position of the three, and will adjoin the submarine basin of the two docks already under construction. One has been excavated to the required depth, and is being bottomed with 25 feet of concrete; the excavation of the other is also well forward. According to the revised plans of the Admiralty, sufficient land will be reserved to permit of the construction of a fourth graving dock if necessary. The submarine basin, which was almost completed, is being further deepened to the extent of 5 feet to provide the additional accommodation necessitated by the Admiralty's revised scheme. The proposed site of the administrative offices has also been removed further inland. The foreshore towards the western extremity of the base, and extending for nearly a mile, will be reclaimed and raised to provide sites for an extensive range of workshops.—*United Service Gazette,* May 9.

THE ADMIRALTY 32,000-TON FLOATING DOCK.—There has just been delivered to the Admiralty, for use in the Medway, a floating dock capable of lifting 32,000 tons, and therefore suitable for accommodating the largest of our battleships or battle-cruisers. The dock has been constructed at the Wallsend shipyard of Messrs. Swan, Hunter & Wigham Richardson, who have executed orders for similar docks for the British Admiralty, the governments of Natal, Southern Nigeria, Japan, and Spain, and also for numerous foreign clients in various parts of the world. During this year the same builders have delivered to the British Admiralty three floating docks: one for raising submarines, another for torpedo-boat destroyers, and this battleship dock, the latest and largest yet constructed in the United Kingdom.

The designs of the dock were prepared in conjunction with Messrs. Clark & Standfield, of Westminster, who have a world-wide reputation for such work. It is of the so-called "box" type, with two side walls—that is to say, on each side of the pontoon proper, and running almost the full length of it, there is erected a hollow wall. Not only are these side walls permanently attached to the pontoon, but the dock cannot be divided

into parts longitudinally without the side walls of each part remaining attached to the bottom. This constitutes broadly the difference between the "box-dock" and docks of the "self-docking" type. The latter are built in detachable sections, so that one or more portions of the dock can raise the remainder for purposes of cleaning, painting, and repairing.

Some idea of the great size of the Medway dock may be gained when it it is known that it covers an area of 2¼ acres. The over-all dimensions are 680 feet long and 144 feet wide. The clear width between the rubbing timbers at the top deck is 113 feet. The side walls are 66 feet high on the outside of the dock and rise 46½ feet above the pontoon. In length they are 520 feet along the pontoon deck and 440 feet at the top. The depth of the pontoon is about 20 feet. The weight of steel plates and angles worked into the dock is about 12,000 tons. The dock is designed to lift battleships of displacements up to 32,000 tons, with drafts up to 36 feet. The keel-blocks, of English oak, are spread over a length of 640 feet, and the two lines of bilge-blocks at each side cover a length of 280 feet.

The two forward chimneys are hinged, so that they may be turned down to allow the travelling crane to pass to the forward end of the wall. Landing stages are provided on each side of the dock with stairways leading to the tops of the wall, so that the dock can be boarded at any time, no matter how far it may be submerged.

The gangways are swung on pivots, and, when closed, give access from one wall to the other. At each end of each wall there is a very strong timber roller fender to help to guide vessels when being docked. The mooring attachments have been made exceptionally large and strong, so as efficiently to hold the dock in a tideway.

Each of the side walls has a water-tight deck running the whole length, and the bottom pontoon is divided both transversely and longitudinally by a number of water-tight bulkheads. These bulkheads and decks divide the pontoon and walls into about eighty water-tight compartments. These are grouped into sections, each of which has its own set of valves, so that it can be flooded or emptied independently. There is a complete service of telephones to connect the various machinery spaces with the principal control station in the valve house, which is placed on the starboard wall at its forward end. From this station are controlled all the valves and pumping arrangements for the various compartments of the dock. A number of pressure gauges show the height of water in each compartment. The gear for operating the valves is on the Westinghouse electro-pneumatic system.

The steam power is supplied from eight boilers of marine type, working at a pressure of 155 pounds per square inch, constructed at the Neptune works of Messrs. Swan, Hunter & Wigham Richardson, Limited. Two of these boilers are placed at each end of each wall. The pumping machinery, supplies by Messrs. Gwynnes, Ltd., of Hammersmith, includes eight compound condensing engines. Each drives a set of centrifugal pumps. For wash-down and fire services two direct-acting steam pumps have been placed in each wall, capable of delivering 400 gallons of water per minute. A dynamo room is provided in each wall, the installation of machinery comprising duplicate sets of Messrs. Browett, Lindley & Co.'s two-crank compound high-speed engines, running with forced lubrication, and driving Westinghouse direct-current generators. This equipment of electrical machinery supplies current for driving the machinery in the workshops, the travelling cranes, the valve gear, and for lighting, etc.; through flexible conductors, power and light are also supplied to any warship that may be in the dock. In each wall of the dock there has also been placed an air compressor providing power for a complete equipment of pneumatic tools, and also for actuating the electro-pneumatic valve-opening gear.

In the starboard wall there is a fine range of workshops. These include a coppersmith's shop, 27 feet long, and three other shops, each 50 feet long—namely, a lathe shop, a smithy, and a machine shop. These workshops are remarkably well equipped, and contain a number of fine tools, such as high-speed lathes, boring and milling machines, an electro-pneu-

matic power hammer, a flanging machine, punching and shearing machines, forges, an hydraulic pipe-bending machine and planing machines. In the port wall living accommodation, including mess rooms, lavatories, etc., has been provided for the dockmaster, petty officers, and dock crew. On the top of each wall there is a 5-ton electric crane, constructed by Messrs. Booth, of Rodley. These cranes have separate motions for travelling, revolving, derricking, hoisting and lowering. Eight powerful steam-driven capstans, supplied by Messrs. Harfield, are placed on the walls for warping ships into position.

The dock was towed from the Wallsend shipyard to the Medway by four powerful tugs owned by Messrs. L. Smith & Co., of Rotterdam. The voyage was safely accomplished, and the dock is now ready to undergo the lifting trials in the presence of the Admiralty officials. It will not be possible to provide a battleship with a displacement of 32,000 tons, but it is hoped that the Admiralty will test the dock with the largest vessel they possess.—*Engineering*.

This dock was tested July 10, 1912 in Saltpan Reach under officials from Chatham dockyard. Was successful. The battleship *St. Vincent* will be the first vessel to be docked.

THE NAVAL FLYING WING.—The first appointments of naval officers to the newly organized Royal Flying Corps conform to general expectations, and on the whole will be approved by the service. Captain Godfrey M. Paine's appointment as commandant of the Central Flying School on Salisbury Plain will be especially popular. It it a distinction for a naval officer to be the first occupant of this post, the work of which will be of a military as well as a naval character. At the Central School, the preliminary training of pilots will be carried out, three courses of about four months each being held every year for this purpose. The number of flyers at present estimated for naval requirements is forty per annum; not more than one-fourth of this number have as yet passed through the course at the Royal Aero Club's ground at Eastchurch, which is being utilized until the Central School is ready, but the further appointments for training there show that the Admiralty will have no difficulty in reaching the figure specified in the Memorandum on Aviation recently issued. Captain G. M. Paine is not only a progressive officer, but he has been associated with the development of the Eastchurch School since August last, and has qualified for an aerial pilot's certificate by a flight on the Short biplane No. 38. Simultaneously with his appointment to Salisbury Plain, Commander Charles R. Samson is to be commandant of the Naval Wing of the Royal Flying Corps. He will, of course, be stationed at Eastchurch, where the more advanced and special training of the naval pilots will be carried out, and hydroplaning, with boat flying, will be taught. Commander Samson's rise in the new branch has been both notable and rapid, but his success has been achieved by making the most of the opportunities that have come to him and by the daring and skill which have characterized his work. The good wishes of the navy will be with Captain Paine and Commander Samson on taking up their new appointments, and it may confidently be expected that progress in the near future may be even more marked than of late.—*Army and Navy Gazette.*

REQUIREMENTS AS TO SPECIALIZATION IN ENGINEERING.—It has been decided as a temporary measure to suspend the regulation as to the length of service necessary to render naval officers eligible to specialize in engineering. As the first course to qualify for specialization will commence in October, 1913, and at that date there will not be a sufficient number of lieutenants eligible by service, officers desirous of qualifying in engineering will for the present be considered for selection, provided they have performed their six months training in the engine room and have obtained their deck watch-keeping certificate. Lieutenants and sub-lieutenants who entered as naval cadets in September, 1903, and January, 1904, are now permitted to send

in their applications to specialize in engineering with a view to a selection being made for the first course.—*Engineer.*

King George reviewed the battle fleet the second week in May at Portland. The ships were handled in shifting fog and thick weather. The targets were much obscured, but the practice firing, particularly that of the *Orion's* 13.5-inch guns, was excellent. Six submarines attacked the *Neptune* and *Hercules* at sea. The periscopes were but ill-defined splashes in the sea and fog. The *Neptune* was hit twice, once from a bow tube and the other from a stern tube after passing under the battleship. The boats were within 300 yards of the ships when discovered by them. Four aviators located the King's yacht in the thick fog. They used hydro-aeroplanes and found that submarines under water could be seen quite readily.

Submarine *D-4* took the King on a two-mile submerged run outside of Portland harbor.

INCIDENT ON THE "THUNDERER."—*Thunderer* (battleship, Capt. H. Oliver, M. V. O.).—Replying to Mr. Falle in the House of Commons, Mr. Macnamara said:

"I am glad to have this opportunity of giving an emphatic contradiction to the alarmist reports that have appeared in the press, and constitute a gross slander upon the conduct and bearing of the personnel of the Royal Navy. I will read to the House the official account of the accident that has been forwarded to the Admiralty by the commander-in-chief, Devonport:

"'The last shell, except one, was being lowered to "Y" shell room in the service-pattern sling, the point of the shell being upwards. It was about half-way down when owing to a kink in the wire whip a turn came off the drum of the electric winch, and the projectile took charge and fell to the deck of the shell room. It struck an iron ladder on the way down, damaging the rungs and knocking off the cap of the fuse. The shell had been fused on the upper deck. It was immediately hoisted up again and the fuse examined by the lieutenant (G.) and found correct, a cap was put on and the shell returned to its bay, where it now is quite serviceable. No one was hurt, and the ladder will be repaired by the ship's staff. The work of taking in ammunition was not stopped, no one left his station, and there was no consternation.'

"I may add that the fuse is a percussion fuse and was fully protected for transport by means of a cap as well as by its own safety arrangements."—*Army and Navy Gazette.*

STRATEGICAL ARRANGEMENT OF THE BRITISH FLEET.—The policy of naval economy instigated in 1906 by the economists, and maintained for some two years or more, deprived the fleet of considerable cruiser force, thus weakening what has been known for many decades as our Empire patrolling; this policy has made it possible for critics of our present fleet organization to assert that we have abandoned our Empire defence, a statement which, although it has a coloring derived from the foregoing facts, is not quite true in substance. It would, indeed, be ridiculous to take much notice of it were it not calculated to mislead the oversea Dominions, who, after years of naval support and protection by the mother country, are having the fact brought home to them that the task of Empire patrol is now one that cannot easily be borne by the motherland in its entirety. The factors that have brought about this situation are numerous, but the salient ones, briefly dealt with, are: (1) The increase of contemporary naval power adjacent to the heart of the Empire, which necessitates a corresponding increase in our home fleets; (2) the policy of weakening instead of strengthening our cruiser power on the Empire trade routes, which, it may be remarked, is not the fault or neglect of the present War Minister or Sea Lords; (3) the neglect shown hitherto in coming to a decision or agreement with the merchant marine on the question of arming mercantile craft should war be imminent or active. All these matters are, we believe, being remedied

as quickly as such a colossal task can be attended to in all its details, but during the evolutionary stage some safeguard was absolutely necessary, and the concentration of our naval power, under the present organization, is the plan adopted. It represents neither the abandonment of Empire patrol or guardianship, but is simply a precaution taken during the period that errors of the past decade are being corrected, and we feel certain that the observant populace of our far-flung Dominions will realize that such a course was necessary.

Mr. Balfour says: "There are two ways in which a hostile country can be crushed. It can be conquered or it can be starved. If Germany were masters in our home waters she could apply both methods to Great Britain. Were Britain ten times master in the North Sea she could apply neither method to Germany. Without a superior fleet Britain would no longer count as a power. Without any fleet at all Germany would remain the greatest power in Europe." Out of these few sentences British statesmen should be able to clearly discern which way our safety lies.

The most absorbing topic of the situation is that which presents itself in the Mediterranean. Unless we were to consider the possibility of great European coalition, such as Germany, Italy and Austria-Hungary, arrayed in war against us at the same time, there seemed no need to keep bottled up in the Mediterranean a strong and useful battle fleet, when by holding the wayside fortresses and both entrances to the middle sea we could just as effectively maintain command of our eastern routes. The conference, which has just been concluded at Malta between Lord Kitchener, Mr. Asquith and the First Lord of the Admiralty, was but another step towards the consummation of this strategy. The Egyptian garrisons will probably be strengthened, the wayside garrisons in the Mediterranean made siege proof, and the sea power, thus released for a time, utilized along the more open routes, or if necessary to cover the heart of the Empire. Australia, India, South Africa and Egypt will in course of time join hands, which they can safely do as long as the Japanese alliance holds good, whilst with the opening of the Panama Canal and the completion of the Cape to Cairo Railway, which are larger factors in Empire consolidation, the present disposition of not only the fleet, but also much of British land power seems to be proceeding on sound lines. There is, however, a paucity in our sea power at the present time which makes careful strategy necessary.—*United Service Gazette.*

THE ENGLISH NAVAL MANEUVERS.—These were held in July and were preceded by a review of the fleet at Spithead on July 9. The members of the Houses of Lords and Commons inspected the fleet and saw two flights by naval hydro-aeroplanes, destroyer and submarine attacks, and the getting under way of the fleet. There were six lines of vessels, a summary by classes of which follows:

Battleships	42
Battle-cruisers	5
Armored cruisers*	26
Protected cruisers	9
Flotilla cruisers	12
Depot ships for destroyers and submarines	9
Mine layers	6
Mine sweepers (torpedo gunboats)	3
Destroyers	107
Submarines	19
Hospital ship	1
Total	239

*Including the light battleships, *Triumph* and *Swiftsure*, which will be employed as cruisers during the maneuvers.

The *Thunderer* flew the flag of Prince Louis of Battenburg, the commander-in-chief of the combined fleets, and also in command of the Blue fleet for the maneuvers. This fleet had nearly twice the strength of the Red fleet under Sir George A. Callaghan with the *Neptune* as flagship. The number of flag officers afloat on this occasion is noteworthy. There were a total of twenty, including in the list five vice-admirals and fifteen rear-admirals. The maneuvers hoped to give as an object lesson that the nation must see the necessity of maintaining above all else the supremacy of the North Sea, the command of the Mediterranean being distinctly secondary to that.

At 5 p. m. the signal was made for the fleet to weigh, and precisely to the moment the long line of cruisers began to move away to the eastward. In ordered precision, led by the huge battle-cruiser *Lion*, each ship maintaining her distance from the one ahead of her, at a speed of eight to ten knots, the first, second and third cruiser squadrons passed away up Channel and out of sight. Two more divisions of cruisers followed in single file, and then came the battleships in two columns of divisions in line ahead.

The maneuvers began at midnight July 12. The Red fleet, the attacking fleet, had as its main object that of landing troops on the northeast coast of Scotland, and to capture or blockade all the shipping ports on the east coast.

A party of 400 Royal Marine Light Infantry and 200 Royal Marine Artillery proceeded from Portsmouth by steamer to the Orkney Islands, to take up a defensive position and prevent any attempt to land.

Milford Haven was defended by four cruisers and two mine layers from the Blue fleet, the forts being manned by artillery.

Sir William H. May on the *Euryalus* was chief umpire.

Few details are available as to the actual work of the fleets. Several minor accidents, such as collisions between destroyers, the grounding of a submarine on the Pentlands Shoals, took place, but no lives were lost.

A landing from the Red fleet did take place at Filey. The numbers landed were so few, before the defenders came upon the scene, that they must certainly have been taken prisoners in actual warfare.—*Army and Navy Gazette.*

The battle-cruiser *Lion* distinguished herself by coming on the scene early and holding the raiders in check until her slower consorts came to her assistance. This landing was not a success. The torpedo craft played a very prominent part in the operations. A small part of the Red fleet escaped into the Atlantic by the north, which furnishes an argument for the basing of a battleship squadron at Gibraltar, and cruiser squadrons at Queenstown and Pembroke for the protection of the many steamer lines converging on these points.

ITALY.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Dante Alighieri	19,000	23	12 12-in., 16 3-in.	Castellamare	Commissioned
Cavour	22,000	22	13 12-in., 14 3-in.	Spezia	Launched Aug. 10, 1911
Giulio Cesare	22,000	22	same	Ansaldo-Armstrong	" Oct. 15, 1911
Leonardo da Vinci	22,000	22	same	Genoa (Odero).	" Oct. 14, 1911
Andrea Doria	25,000	23	13 12-in., 14 5.9-in.	Spezia	Laid down Mar. 24, 1912
Duilio	25,000	23	same	Castellamare	" " Apr. 30, 1912
Dandolo	28,000	25	10 14.2-in.	....	Projected
Morosini	28,000	25	same	....	"

PROGRESS OF VESSELS.—The *Dante Alighieri* has gone into service after completing some successful trials. The *Conte di Cavour*, the *Giulio Cesare*, and the *Leonardo da Vinci* will join one or other of the Italian squadrons in July, 1913. The *Andrea Doria* and the *Duilio* will not be ready for service until July, 1915. The Italian Admiralty will shortly commence the construction of two ironclads, which are to have a displacement of 28,000 tons, and which are to steam at the rate of 25 knots. They will have four turrets, two forward and two aft, so as to have five guns available when chasing, and a similar number when retreating. The new ironclads are to be ready for service by July, 1916.—*Engineering.*

TRIALS OF "DANTE ALIGHIERI."—These were satisfactory. In seven days only the battleship put to sea three times for maximum speed and endurance trials. She developed 16,500 and 26,000 horse-power. On her return to Spezzia she steamed at 24 knots (according to *Moniteur de la Flotte*) and her turbines of the Parsons' type worked perfectly without strain on the personnel or any of the usual mishaps on trial trips.

The *Dreadnoughts Nos. 7* and *8* will probably be named *Dandolo* and *Morosini*. They will have from 26,000 to 29,000 tons displacement, have ten 14.2-inch guns, and a maximum speed of 25 knots. The cost is estimated at $18,000,000 each.

The torpedo-boat *OS13* of 120 tons made over 30 knots on her trials with 3200 I. H. P. The armament of the boats of this type consists of two torpedo tubes amidships and two 7.6-cm. guns.

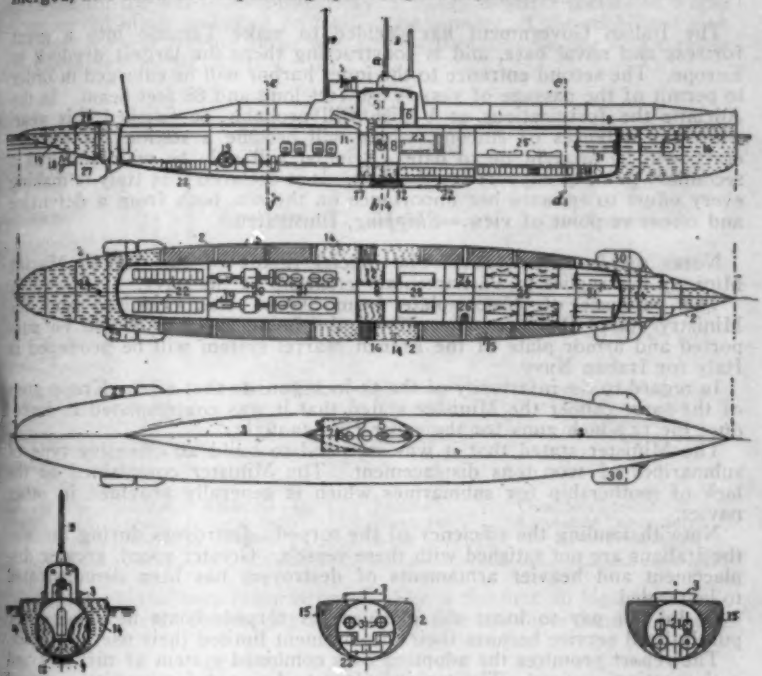
As a result of the war Italy is determined to increase her navy. Parliament appropriated a supplementary law to that of the 1912-13 budget, giving 15 million lire for building larger torpedo vessels and 6.5 million lire to increase the personnel of men from 31,000 to 33,000, and providing for additional supplies of coal and ammunition and for radio stations and aviation apparatus.—*Marine Rundschau*, by W. H. B.

ENDURANCE TEST OF SUBMARINE.—June 14 and 15 the submarine *Glauco* was submerged for a period of 22 hours with full crew on board to test the endurance of the personnel when so long submerged. The naval surgeon who conducted this test reported that the crew sustained no injury and that their health had not been impaired by having been submerged in the submarine for that long period of time. Similar tests are to be made with other Italian submarines. The submarine *Foça* will make a 12-hour submerged cruise in the Adriatic.—*Marine Rundschau*, by W. H. B.

DISEMBARKATION OF THE ITALIANS AT DERNA.—The rafts or iron pontoons practically used were 19 feet 6 inches long by 9 feet 9 inches wide and 3 feet high carrying 38 to 40 men, or from 8 to 10 horses each. Joined together in pairs, by means of locking bolts previously fitted, they can take 90 to 95 men, or 20 to 24 horses each pair. Four of these rafts were carried —two forward and two aft, supported on iron crutches—on each of the Italian troop transports. It was found that they could be lowered into the water and locked together in pairs in four or five minutes in calm weather. —*Journal of the Royal United Service Institution.*

THE ITALIAN SUBMERSIBLES.—In the Italian naval construction program for 1910-11 provision was made for building a flotilla of submarines, the units of which were to be of a variety of types, in order to test the relative merits of different designs. Two of these vessels, the *Galileo Ferraris* and the *Giacinto Pullino*, are of the *Cavallini* type, and are nearing completion at Spezzia. They have a displacement of 400 tons, a speed of 18 knots above water and a speed of 14 knots when running submerged. Two other boats, the *Nautilus* and the *Nereide*, are being built

at Venice, and are of the *Bernandis* design, while eight units, the *Argo, Fisalia, Medusa, Salpa, Velella, Yalea, Yantina,* and *Zoea* are being constructed by the Fiat Company. The latter eight vessels are very similar in type to the Laurenti submarine *Foça*, except that they are somewhat larger. Their displacement is 250 tons at the surface and 300 tons when submerged, and their corresponding speeds 13 and 8½ knots.



SECTION A–B. SECTION C–D. SECTION E–F.

1. Inside or water-tight hull.
2. Outside hull.
3. Surface navigation platform.
4. Detachable safety weight.
5. Conning tower.
6. Steering gear for submarine navigation.
7. Steering gear for surface navigation.
8. Diving rudders control.
9. Periscopes.
10. Signal mast.
11. Torpedo passage.
12. Water ballast for inside hull.
13. Trimming tanks.
14. Water ballast for outside hull.
15. Oil fuel tanks.
16. Lubricating oil tanks.
17. Fresh water tanks.
18. Reversible propellers.
19. Propeller reversing gear.
20. Electric motors.
21. Diesel engines.
22. Storage batteries.
23. Officers' quarters.
24. Galley.
25. Crew's quarters.
26. Closet.
27. Lower vertical rudder.
28. Upper vertical rudder.
29. After diving rudders.
30. Forward diving rudders.
31. Torpedo tubes.

THE ITALIAN SUBMERSIBLE "ATROPO."

—From *Engineering*.

The thirteenth and last vessel of the new flotilla was built by Messrs. Krupp and was launched at Kiel in the end of March. This boat, the *Atropo*, is illustrated in the accompanying engraving. She has a length between perpendiculars of 146 feet and a moulded breadth of 14 feet 6 inches, her under-water displacement being 320 tons. On the surface her speed is 12½ knots, and in this condition propulsion is secured by 2 two-cycle Diesel engines of 350 horse-power each. When running submerged she

employs two electric motors of 200 horse-power each, and attains a speed of 8 knots. The radius of action is 1300 miles above water and 40 miles submerged.

Heavy oil Diesel engines are being used in all the vessels of this flotilla, that of the *Atropo* being of the Germania design, and that of the others either M. A. N. or Fiat productions.—*Engineering.*

The Italian Government has decided to make Taranto into a great fortress and naval base, and is constructing there the largest drydock in Europe. The second entrance to the inner harbor will be enlarged in order to permit of the passage of vessels 650 feet long and 88 feet beam. In the Adriatic the fortifications at Venice will probably be finished this year, while the defences of Ancona, which will become a station for torpedo craft, will be brought up to date. Brindisi will only be maintained as a secondary point of support for the fleet. It is declared that Italy is making every effort to enhance her importance on the sea, both from a defensive and offensive point of view.—*Shipping,* Illustrated.

NOTES ON ITALIAN NAVY.—The official report of the Italian Marine Ministry has replies to Parliamentary criticism of the navy.

The purchase of armor plate from abroad was criticized and the Ministry stated that from henceforth the home industry would be supported and armor plate of the French Marrel system will be produced in Italy for Italian Navy.

In regard to the inferiority of the 12-inch guns to that of the Krupp guns of the same caliber the Minister stated that it was contemplated to introduce the 14.2-inch guns for the super-*Dreadnoughts.*

The Minister stated that it was intended to build an offensive type of submarines of 1000 tons displacement. The Minister complained of the lack of mothership for submarines which is generally provided in other navies.

Notwithstanding the efficiency of the torpedo destroyers during the war the Italians are not satisfied with these vessels. Greater speed, greater displacement and heavier armaments of destroyers has been demonstrated to be needed.

It did not pay to incur the expense for torpedo-boats designated for purely local service because their displacement limited their use in service.

The report promises the adoption of a combined system of turbines and reciprocating engines. The turbine plant to be used for maximum speed and the reciprocating engines for economical cruising.

The report states that efforts will be made to reduce the building period required for battleships and demands the construction of peculiar vessels for the transportation of oil fuel. A revenue marine is also recommended to prevent smuggling.

The war has demonstrated that the Italian merchant marine is not in a satisfactory condition. There is but little hope of any marked improvement in this respect.

In 1911 there were 49 steamers that made their first voyages under the Italian flag. Of these only 8 were built in Italian shipyards, viz.: One cargo boat of 5600 tons, six steamers of 4000-1650 tons, and a small ship of 500 tons.

Italian merchant marine has not made proper progress, and conditions appear to grow worse.

These conditions followed notwithstanding the fact that in 1911 steamship companies throughout the world did a profitable business. The Hamburg-American Line made a dividend of 9 per cent and other companies as high as 12 and 15 per cent.

Two measures are advocated as necessary to revive Italian merchant marine.

1. Support by credit in the naval budget that capital may be invested in the merchant marine with greater security.

2. To provide that all the coal to be used by the Italian Navy shall be carried exclusively by vessels flying the Italian flag. Nine million tons of coal are annually required for the Italian Navy and the freight on this would stimulate that Italian shipping.

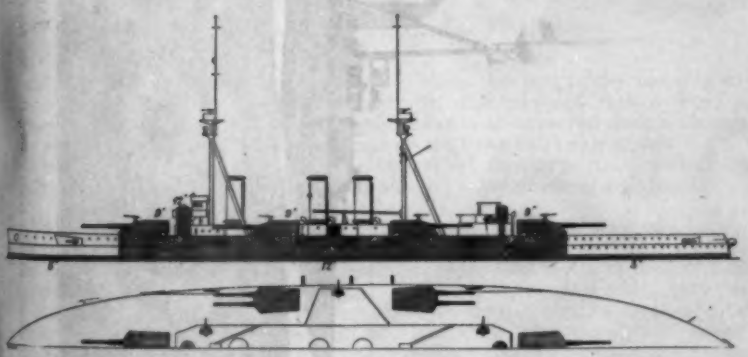
In regard to the strength of the Italian Navy personnel the report states that December 31, 1911, there were a total of 35,753 of which 5830 were called out for the war mobilization, leaving 29,923 in active service of whom 21,305 served afloat and 8618 on land. The number of the mobilized men called out for war serving afloat was 4281.—*Mitthcilungen aus dem Gebiete des Seewesens,* by W. H. B.

JAPAN.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Settsu	20,800	20.5	12 12-in., 10 6-in.	Kure	Completing for sea
Fuso	30,000	22	12 15-in., (?)	"	Laid down March, 1912
Battle-Cruisers					
Kongo	27,500	27	8 14-in., 16 6-in.	Vickers	Launched May 18, 1912
Hiyei	27,500	27	same	Yokosuka	Keel laid Nov. 4, 1911
Haruna	27,500	27	same	Kobe	" " Mar. 16, 1912
Kirishima	27,500	27	same	Nagasaki	" " Mar. 17, 1912
Protected Cruisers					
Shikuma	5,000	26	6 6-in., 4 3-in.	Sasebo	Completed trials
Yahagi	5,000	26	same	Nagasaki	Launched Oct. 3, 1911
Hirado	5,000	26	same	Kobe	" June 29, 1911

The *Kawachi* has been commissioned. She is the first all big-gun battleship to be completed for the Japanese Navy. She has three funnels instead



ARMOR PLAN OF "KAWACHI." —*Engineering.*

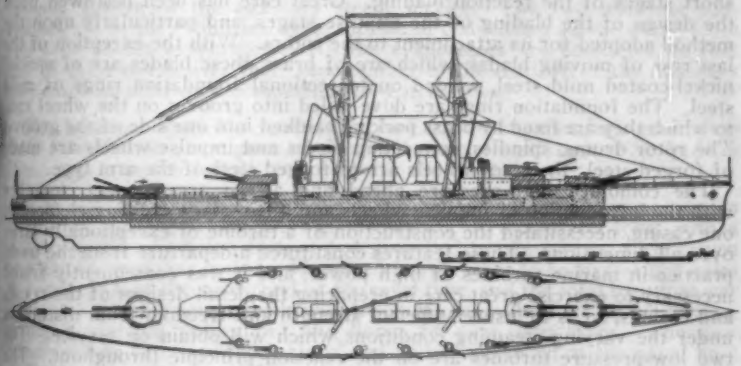
of two as shown in No. 142. Her protection consists of a main water-line belt of 12 inches thick amidships, tapering to 5 inches at the ends. Above this is 9-inch armor along the lower side of the gun-deck, and above

JAPANESE BATTLESHIP "KAWACHI."

Displacement, 21,000 tons; length, 482 feet; beam, 83.9 feet; draft, 26.9 feet; Curtis turbines of 25,000 horse-power; speed, 20.5 knots; armament: [illegible] guns in 6 double turrets, ten 6.54-inch 50-caliber guns, [illegible]

this is 6 to 8 inches of armor behind which are the 6-inch guns. The heavy gun turrets are 9 inches, and there is a 2½-inch protective deck. Motive power consists of Curtis turbines driving three shafts, the boilers being of the Mayabara type. Horse-power is 25,000, and coal supply is 2500 tons. The *Kawachi* was laid down at Yokosuka on April 1, 1909.

THE "KONGO."—This, the first of four battle-cruisers, was launched May 18, 1912, at Vickers' works at Barrow-in-Furness. The other three vessels are building in Japan. They are noteworthy as being the first battle-cruisers to carry 14-inch guns, an increase in size over the guns of the *Lion*. The dimensions are: Length, 704 feet; beam, 92 feet; draft, 27.5 feet; displacement 27,500 tons; speed, 28 knots; maximum coal, 4000 tons; oil, 1000 tons; to be driven by Curtis turbines with horse-power between sixty and seventy thousand; armament, eight 14-inch guns on center line, sixteen 6-inch, 16 smaller guns, and many submerged topedo tubes. The 6-inch are on the upper deck level giving them a wide arc of fire. Armor protection is good, being carried to the height of the boat-deck, the main belt, 10 inches thick, extends well below the water-line and below that is an auxiliary armor belt. There is a special arrangement of armored bulk-



—*Engineering.*

ARMOR PLAN JAPANESE BATTLE-CRUISER "KONGO."

heads protecting the vital parts of the ship, the magazines being completely surrounded with special steel armor. An armored deck is fitted at water-line level, and, in addition to this, there is an armored deck enclosing the ship from stem to stern at the level of the top of the side armor.

There are 36 Yarrow water-tube boilers of the large tube pattern in eight separate compartments on each side of a longitudinal bulkhead.

DETAILS OF THE MACHINERY PLANT OF THE JAPANESE BATTLE-CRUISER "KONGO."—The water-tube boilers burn oil fuel as well as coal; the turbines are of the combined impulse and reaction type; and in the details and in auxiliary engines several interesting improvements have been effected. To ensure safety, the boilers are arranged in eight compartments, four on each side of a center-line bulkhead, which extends throughout their whole length, while the coal bunkers are also disposed to afford protection. Again, the engines—two sets of turbines on four shafts—are arranged in two compartments, with a center-line bulkhead between them. The condensers, four in number, are placed aft of the turbines in two separate rooms, together with centrifugal pumps and other auxiliaries. The whole of the arrangements, including those of the steam and exhaust piping, feed, drain, and oil lubrication systems, are such as to preserve the independence of the

JAPANESE BATTLESHIP "KAWACHI"

Displacement, 21,000 tons; length, [illegible] feet; beam, 83.9 feet; draft, 26.9 feet; Curtis turbines of 25,000 horse-power; speed, 20.5 knots; armament, [illegible] 12-inch 40-caliber guns in 6 double turrets, ten 6.68-inch 50-caliber guns, eight 4.8-inch 50-caliber guns, [illegible] 3-pounder guns, [illegible] 3-pounder guns, [illegible] torpedo tubes.

port and starboard sets of machinery, and allow either set to be worked when all parts of the other are disabled. Thus steam can be got from any of the eight boiler rooms. Each set of turbines consists of one high-pressure and one low-pressure turbine, the former being coupled to the outer, and the latter to the inner, line of shafting on each side of the center line. Both the high and low-pressure astern turbines are incorporated in the after end of the same casings as the corresponding ahead turbines, and thus all four shafts are available for astern working.

The working steam pressure at the engines is 205 pounds per square inch. The high-pressure ahead and astern turbines are, as already indicated, of the Parsons' combined impulse and reaction type, each being provided with an impulse wheel at the high-pressure end. Each impulse wheel carries a single stage of impulse blading, consisting of four rows of rotating blades with their corresponding guide vanes. The nozzles are arranged in groups in such a way that a high initial pressure may be maintained when the turbines are working at reduced powers, as the supply of steam may be shut off from one or more of such nozzle groups. Following the impulse blading are the usual stages of reaction blades, seven in number in the case of the ahead turbine, whilst the astern impulse wheel is succeeded by two short stages of the reaction blading. Great care has been bestowed upon the design of the blading of the impulse stages, and particularly upon the method adopted for its attachment to the rotors. With the exception of the last row of moving blades, which are of brass, these blades are of special nickel-coated mild steel, welded on to sectional foundation rings of mild steel. The foundation rings are dove-tailed into grooves on the wheel rim, to which they are fixed by brass packing caulked into one side of the groove. The rotor drums, spindles, connecting pieces and impulse wheels are made of forged steel; the rotor wheels are of forged steel of the arm type.

The combined high-pressure ahead and astern arrangement, together with the introduction of impulse wheels and a two-stage cruising element in one casing, necessitated the construction of a turbine of exceptionally large over-all dimensions. These features constituted a departure from the usual practice in marine turbines of high power, and it was consequently found necessary to exercise great care in preparing the detail designs of the rotors and casings, so as to insure sufficient strength and freedom from distortion under the varying steaming conditions which will obtain on service. The two low-pressure turbines are on the reaction principle throughout. The object kept in view is a high economy under high and cruising speeds.

The screw propellers are four in number, three-bladed, of manganese bronze, the blades and boss forming one casting. Complete forced lubrication arrangements are provided for the turbine and plummer-block bearings, the oil being supplied by direct-acting pumps, two of which are fitted in each of the four engine rooms. The oil is passed through coolers of the tubular type, the circulating water for which is supplied by a direct-acting pump fitted in each of the four engine rooms. The four main condensers fitted, two in each condenser room, are of the "Uniflux" type, with the tube casings built up of steel plates and angles. The end covers are of cast iron to protect the tubes, etc., from galvanic action. There are two independent air pumps for each pair of main condensers, the pumps being of the "Dual" type, each having one air and one water barrel. The circulating pumps for the main condensers are of the centrifugal type, two for each pair of main condensers. The pumps are driven by independent two-crank engines fitted with forced lubrication. Two auxiliary condensers, one in each condenser compartment, take the exhaust steam from the auxiliary machinery. In connection with the auxiliary condensers, two air and two circulating pumps are provided.

In the boiler room there are eight main and eight auxiliary feed engines of the direct-acting type; the capacity of the auxiliary feed service is equal to that of the main. There are four grease extractors in connection with the delivery pipes of the main air pumps and two for the auxiliary air-pump discharges. Fourteen steam pumping engines are fitted for fire and bilge purposes and for emptying the double bottoms of the compartments.

Four of these pumps are fitted in the engine rooms and the remainder in the boiler compartment; those fitted in the boiler rooms are also capable of being used in connection with the See ash ejectors, ten of which are provided.

The thirty-six water-tube boilers in the ship are of the Yarrow large-tube type, arranged to pass the products of combustion into three funnels. They are loaded to 275-pound pressure per square inch, and are arranged to work under forced draft with closed stokeholds. The boilers are arranged to burn oil fuel as well as coal; a complete installation of pumps, heaters, filters, and collectors, with all connections, being provided and fitted complete for this purpose. Electrical indicators for regulating the firing of the boilers are fitted complete in the boiler room, the furnaces being numbered to correspond with numbers which are periodically displayed on the indicator dials. Five steam-driven air compressors are fitted for cleaning the boiler tubes externally by air jet.

The fans for supplying forced draft to the boilers number thirty-four—thirty-two of the single-breasted and two of the double-breasted type. They are driven by double-acting steam engines fitted with forced lubrication. The six evaporators are worked with steam taken from the auxiliary exhaust system or the auxiliary steam service. The two distilling condensers are of the cylindrical type, capable of condensing all the steam from any four of the evaporators. All the evaporators are connected so that any of them can deliver their vapor either to the distiller or the auxiliary condenser in their own compartment.—*Engineering.*

The Japanese Navy has received from England one 15.2-inch gun. It is their intention to place guns of this caliber on a battleship to be built in Japan and to be finished in 1915, probably the *Fuso.*

A MONSTER DIRIGIBLE.—The Japanese Navy will shortly be in possession of one of the largest dirigibles in the world. It is 310 feet long, with a cubic capacity of 580,000 feet, and is propelled by six screws, each driven by a 120 horse-power motor. The speed in still air is to be sixty-eight miles an hour. It is of the semi-rigid or Parseval type, and the total lifting power is no less than 42 tons, which will enable 20 tons of petrol to be carried, giving a cruising radius, out and home, of over 4000 miles. The new dirigible is to be completed in July, and will be stationed at the naval base at Yokosuka.—*Army and Navy Gazette.*

Extensive improvements in the yards, docks and machine shops are being made at the Japanese Government dockyard at Sasebo, about 46 miles north of Nagasaki. The large wharf is about half completed, and when finished will be the largest of its kind in the East, accommodating eight large battleships at one time. It will be connected with the railroad. The construction of a dry dock 777 feet long, 111 feet wide at the bottom, and 38 feet deep is about completed. This dry dock will accommodate ships of 30,000 tons, being the largest in the East. The engine works, machine shops, foundry, etc., are being extended to facilitate the execution of all kinds of work at the yard.—*Shipping,* Illustrated.

JAPANESE NAVAL POLICY.—The *Marine Rundschau* publishes an account of an essay by Captain Nischimoto, of the Japanese Army, in which he claims that the territorial acquisition in Manchuria is an element of weakness. He claims that the sea girdle is essential to Japan's development and Japan should confine herself to the island territory as England bears that relation to the European Continent. But it was answered that Japan has made her choice by acquiring the Asiatic mainland in Korea and Manchuria and must abide by it.—W. H. B.

COAL SUPPLY.—Rich coal areas have just been discovered on the island of Futago near Takashima Island where the Mitsubishi coal mines are operated. Rich deposits of coal have also been discovered at Hamheung, Corea.—*Marine Rundschau.*

DOCK YARD NOTES.—The labor question is beginning to trouble the Japanese. A strike among the workingmen at the Kure shipyard was finally broken after one week's duration by the intervention of the police. The patriotism of the Japanese laborers has been highly praised, but with the development of the industries the socialistic question will arise and a strike cannot so readily be quieted by the arrest of the ringleaders. After six days, out of 30,000 workmen, there were only 939 who still held out. The Japanese are threatened with another financial stress. The government has issued a new series of treasury notes and paid expenses amounting to $100,000,000 by this issue of notes. Increased taxes are threatened and the increased cost of living is felt in Japan.—*Marine Rundschau.*

ABANDONMENT OF TOGO'S BASE.—The Japanese journal, Asahi, states that after the completion of the military port in Chinhai Bay the naval base at Takeshiki, on Tsushima Island, that was used by Admiral Togo, will be abandoned. The engineering building that was destroyed by fire at Takeshiki will not be rebuilt. The Takeshiki torpedo destroyer base has been transferred to Sasebo and Makung (Formosa). Sasebo and Chinhai support each other strategically, and the base at Takeshiki is no longer necessary. It is probable that Takeshiki will continue to be used as a torpedo-boat depot.

The port at Chinhai will be also a commercial port. It has now 20,000 inhabitants and it is purposed to make Chinhai the center of fisheries in Southern Korea. The railroad from Chinhai to Chyanguon will be begun next year.—*Marine Rundschau.*

ACCIDENT TO "NANIWA."—A Reuter telegram from Tokyo, dated June 27, states that the Japanese cruiser *Naniwa* is ashore on the Kuriles. The vessel struck at 11 o'clock on the morning of June 26 on Brotona Island, and was beached to prevent her sinking. The crew were landed, and there were no casualties. The nearest warship was 500 miles away, and was proceeding to the spot, as also were salvage vessels from Yokosuka. The *Naniwa*, which was launched at Elswick more than 25 years ago, is about 3700 tons displacement. In July, 1894, at the time of Japan's war with China, the *Naniwa* had an engagement with the *Tsi Yuen*, and afterwards sunk the *Kowshing*. She also took part in the battle of the Yalu.—*Army and Navy Gazette.*

PREMATURE GUN DISCHARGES.—The accident on the *Satsuma* by which the plug of a 12-inch gun was blown out, mentioned in last issue of the PROCEEDINGS, is attributed to a faulty design of breech mechanism. On April 2 the plug of a 3-inch gun on the *Hashidate* was blown to rear, killing one and wounding eleven. These accidents are blamed on premature explosions, the gun firing before plug was locked in both cases.

RUSSIA.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Sevastopol	23,300	23	12 12-in., 16 4.7-in.	Baltic Works	Launched June 29, 1911
Petropavlovsk.	23,300	23	same	" "	" Sept. 9, 1911
Poltava	23,300	23	same	New Admiralty	" July 10, 1911
Gangut	23,300	23	same	" "	" Oct. 7, 1911
Emperor Alexander III	22,500	21	12 12-in., 20 4.7-in.	Ivan Bunge Co.	Building
Empress Marie	22,500	21	same	" " "	"
Catherine II...	22,500	21	same	Nikolaieff	"

"GANGUT" CLASS.—The sketch on page 775 of No. 142, showing the *Gangut* class, is in error.

The four turrets are on the center line, No. 2 turret and No. 2 stack having been moved far enough aft to enable No. 2 turret to swing clear of No. 1 stack.

SUBMARINE.—A cruiser submarine is being designed which displaces 4500 tons. It will have a radius of action of 18,500 miles with a speed of 11 knots, while it has a maximum speed of 25 knots on surface and 14 knots submerged. It submerges in three minutes, and has a radius of action in that condition of 750 miles at 6 knots. It will carry 36 launching tubes, five 5-inch guns so as to able to fight above as well as below water.—*Moniteur de la Flotte.*

COLLIERS.—The Russian Government has been offered a guaranteed supply of 164,000 tons of Don coal annually for the Baltic fleet. The Ministry will furnish three million roubles to provide ten colliers of 7000 tons coal carrying capacity from Maruipol to the Baltic. The colliers will become the property of the Russian Government.—*Marine Rundschau.*

BUDGET.—The Russian Douma has finally passed the budget submitted by the Minister of Marine, which amounts up to $79,500,000. The report shows that of this sum $27,250,000 are for ships, $12,000,000 being reserved for the Black Sea fleet.—*Moniteur de la Flotte.*

This five-year program will provide for four big battleships with twelve (nine according to some authorities) 35-centimeter guns and 27 knots speed, with four scouts of 7000 tons with 15-centimeter guns (some state six and others nine scouts) with 36 destroyers and 12 submarines.—*Marine Rundschau.*

The available shipyards are not able to build more than 30 per cent of the ships required by Russia in the next five years, and for this output the shipyards have to be extended and equipped with machinery, which will involve the outlay of many millions of roubles. This is chiefly caused by the fact that the future *Dreadnoughts* are to be 700 feet long as against the 590 feet length of those now building. Private shipyards are to be specially considered in placing the future orders.

The budget includes the following war vessels for the Baltic, which are to be commenced at once: Four armored cruisers of 28,000 tons and a speed of 27 knots, with an armament of twelve 14-inch guns, placed in four armored turrets. These vessels are to be built at the Imperial dockyards. The private shipyards will receive orders for four cruisers of 8000 tons displacement and for thirty-six destroyers of the *Nowik* type. There are further twelve submarines of the *Black Sea* type to be constructed. A new base for the Baltic fleet is to be established at Reval, for which a large equipment of machinery will be required.—*Marine Engineer and Naval Architect.*

TURKEY.

VESSELS BUILDING.

Name	Displacement	Speed	Armament	Builders	Remarks
Battleships					
Reshad-I-Hamis	23,000	21	10 13.5-in., 16 4.7-in.	Barrow	Building
Reshad V.....	23,000	21	same	Elswick	"

The Turkish Government has made important additions to the plans which were originally drawn up for the reorganization of the naval arsenal at Constantinople. The original proposal to grant a concession to a private company to carry on the business of the arsenal has fallen through, and it is now reported that the government will no longer confine themselves to developing and modernizing the Golden Horn establishments, but will construct a new naval harbor and arsenal. For this purpose the Gulf of Ismidt and the Asia Minor bank of the Sea of Marmora, between Djirmen-Dere and Kazikli, have been suggested. To supplement the naval harbor at Ismidt it is proposed to establish another harbor for torpedo-boats at Laz-Bournou, a strip of land on the Asia Minor bank, opposite Stambul, and in this connection the Ministry of Marine recently published a notice inviting contractors for quay works, etc., to send in estimates. In addition to a quay, it is said that a breakwater will be erected there, as well as stores for ammunition, coal and drinking water.—*Shipping*, Illustrated.

The Admiralty has worked out an extensive naval construction program which includes twenty vessels to be built in the course of the next six years. It is stated that the Admiralty is already negotiating with leading English shipyards to undertake their construction on terms similar to those of the two *Dreadnoughts* now being built in England.

The increase of the fleet has shown that the existing dockyard in the Golden Horn is insufficient, and therefore the plans of the Admiralty suggest the establishment of a new dockyard on the Bay of Ismidt on the opposite coast of Asia Minor.—*Marine Engineer and Naval Architect.*

UNITED STATES.

VESSELS BUILDING.

Number	Name	Displacement	Speed	Armament	Where Building	% of Completion		
						June 1	July 1	Aug. 1
	Battleships							
32	Wyoming....	26,000	20.5	12 12-in., 21 5-in.	Cramps	98.3	99	99.3
33	Arkansas.....	26,000	20.5	same	Camden	97.4	98.7	99.3
34	New York....	27,000	21	10 14-in., 21 5-in.	N. Y. Navy Yard	40.1	44.5	48.2
35	Texas.....	27,000	21	same	Newport News	66	68.8	72.1
36	Nevada.....	27,500	20.5	10 14-in., 21 5-in.	Quincy	....	2.4	4.6
37	Oklahoma....	27,500	20.5	same	Camden	.7	2.1	3.1

"TEXAS."—The principal dimensions of this vessel and the *New York* are: Length, 573 feet; beam, 95¼ feet; draft, 28½ feet; displacement, 27,000 tons; speed, 21 knots; ten 14-inch guns; twenty-one 5-inch guns, 19 of which are mounted on the main deck, 10 being in a central battery protected by 6-inch armor. The remaining two 5-inch guns are mounted on the superstructure near the conning-tower. The water-line belt is of 12-inch maximum and is complete. A stroke of 9-inch armor extends above this to the main deck. Transverse bulkheads are of 10-inch. Turrets are 12-inch. Reciprocating engines.

U. S. S. "ARKANSAS" AND "WYOMING."—These vessels are 562 feet in length; beam of 93 feet 2½ inches; draft of 28 feet 6 inches; full-load displacement 27,243 tons, with normal displacement of 26,000 tons. There are four shafts driven by Parsons' turbines. Coal capacity is 2500 tons, and 400 tons of oil are carried in addition.

There are twelve 12-inch 50-caliber guns, with twenty-one 5-inch 51-caliber guns, and two 21-inch submerged torpedo-tubes. Armor belt is 11 to 9 inches, upper belt 10 to 8 inches, and turrets 12 inches.

SPEED TRIALS.—The *Wyoming* made a maximum speed of 22.045 knots on her trials. In her trial trips the U. S. S. *Wyoming* not only made a splendid speed record, but did it at a minimum consumption of coal. On her four-hour full-speed trial she made an average speed of 21.223 knots per hour. Her specifications called for 20.5 knots per hour, thus exceeding her contract speed .723 knots per hour. In her standardization trials the highest run was 22.055 knots per hour. Her best showing was on her twenty-four hour nineteen-knot endurance run, when she consumed only 350 tons of coal. Her sister ship the *Arkansas*, consumed 369.63 tons of coal on the same run. The *Wyoming* made her endurance twelve-knot trial with a consumption of 144 tons of coal, against 157.284 tons for the *Arkansas*. The *Wyoming* is .17 of a knot faster than the *Arkansas*, according to the records made in the four-hour full-speed trial.—*Army and Navy Journal.*

Official figures of the recent builder's acceptance trials of the battleship *Arkansas*, show an average speed of 20½ knots an hour for four hours. The figures follow: Fastest mile on standardization trial, 21.493; average of five high-speed runs, 21.153; average of 4-hour run, 21.051; average on 2-hour run, 20.989; maximum horse-power developed, 29,271.—*Shipping*, Illustrated.

The new drydock No. 4 at the navy yard, Brooklyn, N. Y., which has been finally constructed after many difficulties and the failure of several contracting firms which undertook the work, was well tested on May 9, when the 21,000-ton battleship *Utah* was successfully docked. The structure is large enough to take in a vessel 690 feet long and 110 feet beam, or approximately 40,000 tons displacement. It is 728 feet long and 120 feet broad. It is built of reinforced concrete, lined and trimmed with vitrified brick and Massachusetts granite, and is the first of three drydocks of the width of the Panama Canal to be completed. The firm that finally completed the work was Holbrook, Cabot & Rollins, a Boston corporation, on a bid of $1,369,000. After much difficulty with quicksands Civil Engineer Frederic R. Harris, U. S. N., who had been assigned to the yard, suggested the use of pneumatic caissons for the dock construction. This plan was adopted. The dock, all told, has cost about $10,000,000. The entire proceeding of guiding the *Utah* to the dock, adjusting her over the keel blocks, of setting in place the gate and of pumping out the water within the docks consumed little more than three hours.—*Army and Navy Journal.*

TRIAL OF THE "BEALE." June 27.—The torpedo-boat destroyer *Beale*, built for the government by the Cramp Shipbuilding Company, returned to the yard of the company after a successful builders' trial trip.

The boat made a maximum speed of 33¼ knots in several tests off Lewes, Del. This is a new record for the Lewes course. The boat's contract called for 29½ knots an hour.

DESTROYER SMOKE ELIMINATION TESTS.—Steaming at a rate of 30.5 knots in a run of two hours at full speed, the *Mayrant* won the speed and smoke elimination tests of the third group of destroyers of the Atlantic fleet run off Newport June 18. The *Walke*, 30.3 knots, was second. The *Perkins*, with a broken blower, was placed third with a record of 30.2 knots. Speed conditions were two hours, straight ahead. Four hours was the time for the smoke elimination trials. Smoke elimination is regarded as important, for the destroyer showing the least smoke would be most useful in action.

The *Mayrant* did not show any smoke. The *Walke* showed smoke 8 minutes and the *Perkins'* funnel was discharging for 19 minutes 2 seconds. The destroyer *Patterson* holds the navy speed record with 32.9 knots.—*Shipping*, Illustrated, June 22.

The U. S. submarine, *G4*, the first vessel of her type to be built in this country, was launched August 15, at Cramp's shipyard, Philadelphia. The *G4* was built by the American Laurenti Co. at the Cramp yards from the designs of the Fiat San Giorgio Co., of Spezzia, Italy. The length over all is 157 feet 5¾ inches; beam, 17 feet 6 inches; displacement in surface cruising, 358 tons and displacement submerged, 458 tons.—*Shipping*, Illustrated.

ORDNANCE AND GUNNERY.

GUNS AND PROJECTILES.

The latest British battleships are to carry a "13.5-inch A." As this gun is known to be designed for a 1400-pound projectile in place of a 1250-pound one, it is not improbable that the "13.5-inch A" will turn out to be akin to the "12-inch A" of glorious memory. In the latter case "A" stood for "plus 1½ inch." There seems to us something rather fatuous about mysteries of this sort. No one is deceived except those whom there is no object in deceiving. The secondary armament of the new ships will consist of 6-inch guns—which should never have been given up when *Dreadnoughts* were introduced.—*Engineer.*

LEWIS AUTOMATIC GUN.—On the *Nettuno* Admiralty range at Anzio, near Rome, a series of ten days test trials against airships with guns specially constructed by Messrs. Krupp for the Italian Government has just been terminated. The tests, which were executed in the presence of the Minister for War, General Spingardi, and the On. Leonardi Cattolica, First Lord of the Admiralty, besides a commission of experts appointed by the government and the representatives of the Krupp firm, were made first against balloons, to represent airships, towed at the rate of 12 knots and at the distance of about two kilometers from the beach. The balloon kept at various heights, was made fast to a ship, which was in its turn towed by a torpedo-boat. Another experiment was made with two balloons of 15 cubic meters and 25 cubic meters respectively, launched at the same moment into the air at 5 kilometers distance. These were both set on fire. The gun, which is of 70 mm. caliber, with an inclination of 75 degrees, has a range of 7 kilometers. The course of the projectile fired is marked by a slight smoky trail which enables the gunners to adjust the aim.—*The Engineer.*

ARMOR VS. GUN.—There is a tendency to increase armor thickness as the size of ships increases, and in the most recent United States ships this has been done, but increases hitherto made can hardly be regarded as adequate, and it must be admitted that at the moment the gun is superior to the armor. Whether the armor will again forge ahead by superior combination of old elements, the development of still further improved armor, or the devotion to armor of a larger proportion of the displacement, it is impossible to say, but there is great need for improvement in protection, and it would seem fairly safe to prophesy that for some years to come we may expect to see the protection developed relatively more rapidly than the attack. I think that is certainly the proper and much-needed line of development. An alternative is to give up the fight and practically abandon armor.—Extracts from a paper *Recent Advances in the Art of Battleship Design*, by Naval Constructor D. W. Taylor, U. S. N., appearing in the Journal of the Franklin Institute.

TRACER SHELL.—That the Japanese are determined to do more night fighting than ever in the next war may be inferred from the fact that they have introduced into the service an illuminating 50-pound shell for the heavy field gun, containing sufficient magnesium composition to give a bright light for fully twelve minutes. In battle, salvoes of these shells will be fired into an enemy's works before the assault is delivered. It has been found by experiment with dummy figures that the defenders when they stand up to fire are sharply silhouetted against the light, enabling the attacking infantry to take good aim at them while themselves lying invisible in the dark. The Russians, too, have learned their lesson as to night fighting from the Manchurian War, and are issuing searchlights at the rate of one per regiment to permit the delivery of well-aimed rifle fire at night both in attack and defence.—*Army and Navy Journal.*

LEWIS GUN.—No smoke, no flame—only the sound of the explosion tells that the gun has been fired. There is no recoil and the gun is so balanced by the magazine that the aim is not even interrupted while the gun is being fired. It can be fired at as high a rate as 750 shots a minute, but the rate may be reduced to 350 shots per minute, or to any number between these limits, by a simple adjustment of the gas-port valve controlling the admission of the gas to the piston cylinder.

The principal and most novel feature of the gun is its air-cooling system. The 30-caliber gun barrel is surrounded by a close-fitting aluminium jacket, cylindrical in form and having some twenty deeply cut longitudinal grooves which extend from breech to muzzle. The gun barrel with its grooved jacket is inclosed in a light steel tube 3¾ inches in diameter, the portion of the tube which projects beyond the muzzle having a reduced diameter of only 2⅞ inches. The inclosed grooves, forming continuous air ducts in the aluminium jacket throughout its length, have free communication with the atmosphere at the breech and each time the gun is fired the ejector action of the discharge blasts sucks in a draft of cool air from the rear through these ducts, thus carrying off the heat transmitted to the jacket from the barrel. The cooling is automatic in action, without the use of water or other cooling liquid and without mechanism or moving parts. As aluminium has six times the heat conductivity of steel and but one-third its weight, this very effective method of cooling the gun adds but a few pounds to the total weight carried. Another novel feature which differentiates the Lewis gun from all other gas-operated guns is the small inclosed operating spring which is located near the trigger piece at the breech far removed from all injurious heat effects. The temper of this spring cannot be affected by either direct or transmitted heat no matter how rapid and long continued the firing.

When firing at full speed it takes approximately four seconds to discharge a magazine of fifty cartridges, and the empty magazine may be replaced by a full one within two seconds. The drum magazine used with this gun is 8¼ inches in diameter and 1½ inches deep. It is stamped from sheet steel, has an aluminium center piece to hold the cartridges in place, and resembles, somewhat, a reel used for winding cinematograph films.—*Scientific American.*

The latest firing by the army aviators was at a height of 600 feet, the aeroplane traveling at a rate of 50 miles an hour. Captain Chandler, who fired 50 shots, delivered them within a rectangular space of three yards by fifteen yards. Had the machine been 6000 feet in air, the deck of a battleship would present approximately the same target with a result of 100 per cent of hits. Captain Chandler is of the opinion that it is possible to carry in an aeroplane 1000 rounds of ammunition in the drum magazines with a maximum total weight of 100 pounds.

THE TACTICAL USE OF BATTLE-CRUISERS.—Reasoning theoretically, what is the plan for using battle-cruisers in future battles? Besides the part of a

TABULATED COMPARISON OF BIG GUNS IN BATTLESHIPS OF THE NAVIES OF THE WORLD.

Data of Guns.	Italy.	England.		Austria.		France.		United States.	Germany.			Japan.	
	Model 1906.	Mark XII.		Skoda.					Krupp.	Krupp.	Krupp.	Vickers.	Armstrong.
Caliber in inches:.	12	12	13.5	12	12	12	13.4	14	12	14	15	12	13.5
Length in calibers.	46	50	45	45	50	50	45	45	50	50	50	50	45
Weight in tons....	64	69	80	54	61	61	67	65	53	83	102	67	73
Weight of projectile, lbs.	920	850	1,240	990	990	960	1,320	1,400	850	1,360	1,650	850	1,240
Initial velocity, f.s.	2,800	2,950	2,800	2,600	2,750	2,800	2,600	2,600	3,000	3,000	3,000	2,900	2,700
Energy at muzzle in metric tons.	15,300	16,540	22,150	14,680	16,570	17,100	20,250	20,320	17,510	27,650	33,910	16,000	19,568
Energy per kilogram in kilogm. meters.	240	240	277	270	280	280	301	310	330	330	330	248	268
System of construction.	Wire.	Wire.	Wire.	Built up.	Built up.	Built up.	Built up.	Built up.	Built up.	Built up.	Built up.	Wire.	Wire.
Probable life.....	80	60	60	200	200	200	200	150	220	200	200	80	60
In what class battleships installed.	Dante Alighieri.	Australia.	Queen Mary.	Zrinyi.	VI	Paris.	Lorraine.	Oklahoma.	Oldenburg.	Kaiser.	Weissenburg	Kawachi.	Kongo.
		Neptune.	Lion.	Radetzky	VII	France.	Bretagne	Nevada.	Helgoland.			Settsu.	Fuso.
	Cavour.	St. Vincent.	Centurion.	Viribus Unitis.		Courbet.	Provence	Texas.					
	Doria.		Orion.			Jean Bart.		New York.					
	Duilio.		Conqueror.										

NOTE.—From "Mittheilungen aus dem Gebiete des Seewesens." Centimeters reduced to inches by multiplying by 4. Kilograms reduced to pounds by multiplying by 2.2. The correctness of this table appears only approximate and even then the figures of German ordnance show such a superiority to foreign ordnance that one can seriously question the accuracy of the table. Note the marked superiority of the German 14-inch over our 14-inch and the English 13.5-inch.

scout, which their great speed and their large bunkers allow them to always fill, these powerful ships will be able to undertake the destruction of the enemy's commerce, to close many of its numerous dockyards, and thus contribute to its defeat on the field of battle.

These ships can be used during a battle to win an advantageous position with respect to the enemy's line, to prevent the T, or to turn it, as well as being employed by the stronger fleet to take care of the weakest portions of the line in battle. These ships of speeds of 28 knots and more can reach any battleship, and being armed with the heaviest guns in service, they are capable of forcing the largest of a fleet in retreat to choose between losing a part of its force or of resuming the fight.

It appears from the above that the stronger fleet alone is concerned in possessing battle-cruisers and that the nation which can not hope to have the advantage in numbers ought on the contrary to devote all its means to the building of battleships alone.

The necessity of annihilating first of all the principal fleet of the enemy is more and more important and requires the concentration on the main battle field of all the force that one possesses. So England can not hope to be able actually to part with her *Invincibles* and *Lions* in order to protect her commerce against the enemy, since she does not consider it wise to maintain a force in the Mediterranean which is judged too far from its own coasts where the fate of the nation will be decided.

Thus the English battle-cruisers are attached strictly to the squadrons and will take a direct part in the fight.

It will be the same with the German division, *Von der Tann, Moltke, Goeben,* and *Seydlitz;* the German battle-cruisers will not be able to devote themselves to the destruction of English commerce without passing by the north of England in order to avoid the danger of the fleets of Harwich, Rosyth and Dundee, and returning by the same route to revictual, and after such a long detour will be able to keep the sea but a short time. There being no way of disposing of prizes the battle-cruisers will be unable to fulfill this plan. Furthermore there is the menace of the English fleet 60 per cent stronger than theirs, the Germans will thus have to retain all the capital ships in their fleet. Thus it seems certain that all battle-cruisers will stay with the battle fleet.

Forced to use these powerful units on the battle scene for the same reasons, the opponents will employ them only for decisive combat, only then they will risk throwing them out ahead to take stock of the enemy's fleet, if, indeed, they do not still prefer to keep them near the squadron of the line, in order to be sure of being able to take an immediate part in the battle from a good position.

Thus logic and necessity combine to consider the battle-cruiser as a part of the battle line, and thus its role appears to be primordial. Its speed permits it to give to the enemy's line, held under the fire of the battleships, some blows that its heavy guns render of moment, it will force the enemy's line to maneuver under the fire of its own line; it will turn the head of the line and disable the flagship; it will create finally the diversion necessary to win.

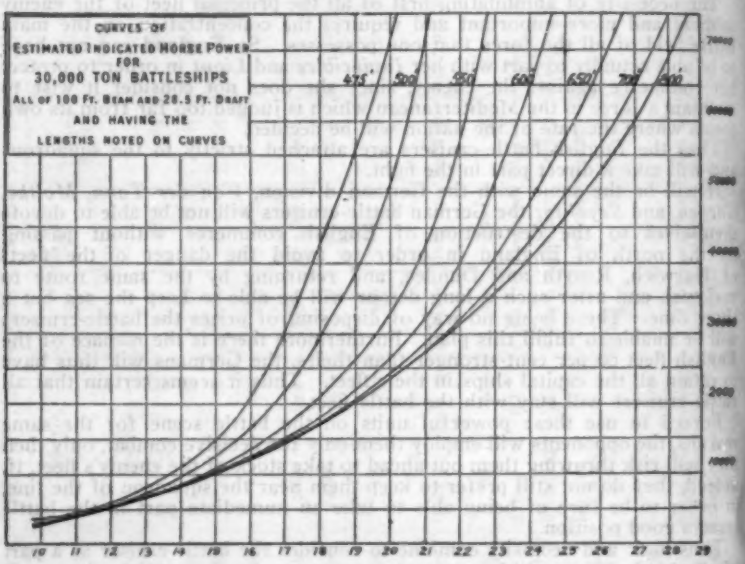
Battle-cruisers are thus necessary to a line of battle fighting another battle line having them, and it is most desirable to keep them when the enemy has lost hers.

The French armored cruisers can not fulfill the role of scouts on account of their slow speed, they will not be efficient against those of their adversaries, having to retreat from the *Moltkes* and *Lions.* In the battle, they cannot be used if the latter enter the fire. Our costly armored cruisers thus become useless; it is thus necessary to build battle-cruisers. Far from weakening our battle line, they will assure it the flexibility which now our battle line composed of ships of one speed does not possess. They will permit the squadron commander to increase his range of tactics and the number of his movements.—*La Vie Maritime.*

NOTE.—From "Mittheilungen aus dem Gebiete des Seewesens." Centimeters reduced to inches by multiplying by 4. Kilograms reduced to pounds by multiplying by 2.2. The correctness of this table appears only approximate and even then the figures of German ordnance show such a superiority to foreign ordnance that one can seriously question the accuracy of the table. Note the marked superiority of the German 14-inch over our 14-inch and the English 13.5-inch.

Duilio. Conqueror. Bart. York.

BATTLE-CRUISERS.—At present there *is much doubt* as to whether the *Moltkes* and *Lions* carry sufficient fuel to enable them to use their high speed in the battle line. Their steaming radius at low speeds is low, and hence the force of the argument that they can engage where and when they will in action probably does not apply. Cruising at uneconomical speeds with the battleships prior to the battle will have utterly depleted their fuel supply. Thus they, at least those at present built, can only perform the duty of being a flexible unit of the fleet in battle. From the results of the *Moltke's* cruise to the United States it developed that, if she were to accompany a fleet, when the day of battle came, she would not have sufficient fuel to allow her to be even the flexible arm. It is difficult to believe that the *Moltke* class can be considered in any other light than failures. The *Blucher* has been the only great success in the all big-gun cruiser type, and she carries but 8-inch guns. The low freeboard aft of the



Moltke is a serious drawback on the high sea. As accounts of her state that her deadwood forward and abaft the rudder is cut away to give her great maneuvering power she must be a very bad roller at sea, and such has proven the case. The English *Orion* class has the same defect. The contour of the *Moltke's* bow gives one the impression that she must pitch heavily and deeply. So far a proper type of battle-cruiser has not been evolved. If we have great speed, we must have large boiler and engine rooms, and consequently the armor must be light, especially as the steaming radius should logically be very great. The last requirement is difficult with high-speed turbines and the *Moltke* proved herself a huge fuel consumer on her run across the Atlantic. How some of the requirements put limits on what the vessel can do is shown in the following extract from an article by Naval Constructor D. W. Taylor, U. S. N., in the *Journal of the Franklin Institute:*

Ratio of Speed to Length.—The influence of length upon speed, sometimes enormous and always important, is obvious from the above diagram.

If we assume that in each case we could put a maximum of 70,000 horse-power into the vessel, which is somewhere near the truth, we see that if she were made 500 feet long the speed would be twenty-one knots, whereas if she were made 800 feet long the speed would be twenty-eight knots.

It is doubtful if sufficient length and space could be given to machinery in a 500-foot vessel to enable 70,000 horse-power to be developed; probably it would not be possible to drive such a vessel over twenty knots, owing to limitation of space for machinery.

Assuming, for the present, that we could get 70,000 horse-power into each vessel, the weight of machinery would be approximately the same, regardless of the length of the vessel; but to build a 30,000-ton vessel 800 feet long would take a very much greater weight of hull than to build a 30,000-ton vessel 500 feet long. This additional weight of hull would have to come from the armor or armament, the 30,000 tons of displacement being fixed. Moreover, the thickness of armor protection for a given weight which could be placed on an 800-foot vessel would be very much less than for the same weight applied to a 500-foot vessel.

It is evident, then, that the penalty paid for speed besides the direct weight necessary to provide for machinery is the additional weight of hull necessary to provide a vessel of the length and form to enable it to be driven at the higher speed, and, superposed upon this, the diminution of the armor thickness, or the restriction of the proportion of the area of the ship protected by armor resulting from the greater length to be protected. The solution of the problem of speed is then obviously a compromise between conflicting considerations, as is the case of so many other problems of warship design.

FIRE CONTROL.

FIRE CONTROL.—The *Thunderer* has been equipped with the Sir Percy Scott central control or "director." It is remembered that the *Neptune*, the first ship to be so fitted, underwent extensive firing trials in the Mediterranean last year with Sir Percy Scott on board. The success of the firing and the sureness of its control led to the placing of these instruments in the *Thunderer*, the second ship so fitted. The fire control officer's station is on the tripod mast abaft and sufficiently above the forward funnel to be clear of heat and smoke. He is placed on a platform at the head of the tripod mast and underneath the steel turret in which are the instruments of the control system.

In English vessels of the *Neptune* and *Indefatigable* classes the masts fitted with fire control stations are forward of the funnels. In the vessels following these, the *Lion* et seq., the fire control position was abaft the funnel, and control positions fitted on the conning-towers.

If a control position aloft is to be used it should certainly be high and where no smoke or hot gases could obstruct clear vision. Tendency appears to be to bring control positions down to a lower level, to armored towers.

The following description of a new range and deflection indicator is taken from *The Naval Annual*. It is called "Follow the Pointer" system. A large dial, with an electrically controlled pointer, is fitted to each sight.

The dial is graduated, and there is an index point on the stationary part of the sight. When the range is transmitted from the control station the pointer is moved round from the zero towards the range at which the sight is desired to be set. The sight setter operates his control wheel so as to keep this pointer always opposite the index mark. This consists in altering the sight until the range on the dial, to which the pointer has been deflected, is brought opposite the zero mark. The same principle applies to the deflection gear.

The whole system comprises a simple transmitting switch, a plain drum with four contact pieces, one of which makes continuous contact, the others alternately engaging with cams. The receiving portion consists of a simple step-by-step motor mounted on a base plate, gearing with a worm and wormwheel of the spindle of the pointer.

The sight may be used with or without the gear, its removal or replacement does not make any difference to the sighting gear.

To the ordinary transmitter there is fitted the repeat receiver, which acts as an indicator to the transmitting number. This repeat receiver registers the transmissions, and thus in itself forms a separate unit, and is exactly in conjunction with the receiver attached to the sight.

Curiously enough, just as the British Navy is more or less ignoring the masts, the Germans have given it a fresh lease. All German ships are now being fitted with small crow's nests, presumably connected with the fire control system. These "nests" approximate very closely to those which the Austrian Navy has employed for some years, and which the American Navy indulged in just before the advent of "basket-work" masts. Previously to this the German ships used their turrets as fire control stations. England and Germany are apparently each by way of adopting what the other is by way of discarding! The presumption is that the ideal fire control station still remains to be discovered.—*Engineering.*

In connection with tripod masts, it is of interest to note that these have recently been fitted to nearly all Swedish battleships at just about the time when the indications are that they will disappear from the British Navy.—*Engineering.*

TORPEDOES AND MINES.

The endeavor to get great speed and great distance with these is ever continuous, but the two cannot go together. At the present state of development, Messrs. Whitehead now denote their two types of torpedoes as the swift torpedo, and the long range torpedo. The first type gives 45 knots speed up to about 1090 yards and averages 40 knots for 1840 yards. This type is for destroyers and submarines. The second type has a speed of 30 knots sustained for over 6560 yards. This is the torpedo for battleships.

SPEED AND EXPLOSIVE CHARGE OF LATEST TORPEDOES.

Diameter Torpedo inches.	Speeds in knots for distances of				Explosive Charge lbs.
	1000 yds.	3000 yds.	6000 yds.	8000 yds.	
18	42½	..	27	..	209
21	..	41	..	27	330

—*Brassy's Annual.*

The battleship *Kongo*, now building for the Japanese Navy, is stated to have a very exceptionally large number of torpedo tubes.

The Schwartzkopff torpedo is a superheated air turbine driven torpedo. Its air heater gives so little external heat that bronze is used for machinery parts.

POWDER.

FRENCH POWDER.—M. Daniel Berthelot, the eminent French powder chemist, had the following remarks, among others, to make on powders before the Society of Civil Engineers of France on June 21, 1912:

Decomposition.—The formation of the powder by the nitration of cellulose represents the chemical phenomenon of etherization, their decomposition, *i. e.*, denitration, represents the opposite phenomenon, that of saponification. These two chemical processes tend to act at the same time and thus establish an equilibrium varying with the temperature. Saponification is favored by the residual humidity of the powder—1 to 2 per cent.

The slow decomposition of powder B shows itself in three phases:

(a) The nitrous products formed are absorbed in the powder itself; no alteration is visible outside, and it is not dangerous.

(b) The critical stage in which the nitrous vapors become free and the reaction hastens.

In many cases this phase terminates in the complete ruining of the powder or third phase.

(c) The powder becomes an inert mass, and is not in the least dangerous.

But in certain exceptional cases—heated, quick action of moisture on the nitrous vapors formed during the drying period—the heat of reaction is sufficient to cause the powder to ignite spontaneously.

These exceptional cases are almost never realized on shore; they are much more apt to occur on shipboard—overheated and damp magazines. Seamen assign to these spontaneous ignitions many accidents that have happened in all the navies of the world.

Stabilizers.—A search for compounds for incorporation in the powder to prolong the life of powders has been made, they being mostly basic substances which are capable of neutralizing the acid products of decomposition. We have successively tried mineral compounds such as bicarbonate of soda, organic compounds such as camphor, urea, amyl alcohol, aniline, diphenylamine and triphenylamine. The diphenylamine is the one that keeps best the chemical and ballistic properties of the powder.

Stability Test.—The 110° C. test is most used in France. The English prefer the test in which the sample is placed in an isolated, double-lined silver heating base—called the Silver Test—heated in an oven to 80° C., and the time necessary to decompose the powder is measured, and in which the interior reactions of the powder raise the temperature 2 degrees. Recently M. Berthelot has introduced the ultra-violet test. This light is a precious agent for accelerating chemical reactions; in a few hours they produce phenomena, which left to themselves would not happen for many months and weeks. Furthermore, quality much desired, this light which as everyone knows plays the preponderant role in the chemical evolution of plants, presents the character, common to the greater part of natural agents, of being less brutal, less harmful than the usual agents of the laboratory, heat and electricity. The chemist and the physician of living beings put into play only the feeble agents, moderate variations of temperature, and weak currents of electricity. In researches with M. Gaudechon, M. Berthelot has stated that exposed to the ultra-violet rays, powders enclosed in test tubes of quartz, placed over a mercury bath, the degree of alteration of the powder and the comparative strength of stabilizers is recognized with certainty by an analysis of the gases given off. This new method should be used with the old to complete and control them.

Precautions.—The stability studies have proved that the decomposition starts always at a weak point, such as that of a fruit pierced which spoils. In this weak spot, we recognize either a bit of foreign matter—often a fragment of iron—or a local alteration of organic substance, proving a fault in the raw material or in manufacture. It is then necessary to watch with the greatest care the purity of the raw material, and to not employ dirty or greasy cotton as has often been done in the past; to forbid the process, which, through a false spirt of economy, has been used, that of *radoubage*—mixing old powders with new—or remixing, introducing the solvent that has evaporated. Particularly in the navy, there will have to be established regular inspections and tests of powders in magazines aboard ship and ashore.

Finally we should pass the law projects now in discussion which, without suppressing the powder monopoly, limits it, in permitting private concerns to manufacture for export and for the government, which will have the good effect of competition.

Future of Ballistic Powders.—Greek fire lasted ten centuries, black powder lasted five centuries, and how long will our nitrocellulose powder last? We are confronted with this problem, is it better to have mineral explosives stable but violent, or to have organic colloid explosives, progressive but unstable?

M. Berthelot does not believe so, and after as it were having felt the pulse by means of the ultra-violet rays of a great number of organic bodies, feels and asserts that there is a fundamental distinction between a straight body or structure, and a cyclic body or in a closed chain. The first are unstable; the second are stable. It appears that these chains have a mutual leaning, and that here is found a superiority in stability likened to that which the arch in architecture offers to the straight line. The day in which we discover a nitrous or nitric ether with a closed chain, which accords to practical needs, we will have a powder both stable as the ancient mineral powders and progressive as the modern organic powders.

But, while awaiting that day, which is perhaps not so very far distant, we agree that the formula and composition of our war powders is good; that it compares most favorably to the best of the foreign powders. When the faults in manufacture are remedied, if not entirely overcome due to the new inspection service, they will certainly reduce, to the extent of human foresight, the risks that our gunners and seamen undergo in time of peace.

TARGET PRACTICE.

FRANCE.—The first squadron fired the last of April. Firing was done: first school of fire, by two ships simultaneously which followed a guide, a distance of 9000 meters, each firing at a moored target; second school of fire, the ships, steaming in column following a guide whose speed, course and distance from the target was unknown, firing one after another, the target being kept between 8000 and 9000 meters. The four cruisers did excellently; the weather was fine.

The firing was controlled from the secondary stations. This requirement necessarily decreased the accuracy of the fire. The *Waldeck Rousseau*, flagship of Vice-Admiral Auvert, made 42 per cent of hits. The average percentage of hits was between 15 and 34.

The targets were two and were formed each of 5 elements of the large targets moored in the Iles d'Hyères passage. The range, unknown to the gunners, had 9000 meters as a minimum, and speed of ships was 15 knots. The firing lasted on each of the two runs 6 minutes, the guide at end of 3 minutes changing course two points.

The results of the firing do not give satisfaction, the long period of idleness and defective preparation being no doubt responsible for this. The matériel worked perfectly save for a slight accident in a *Patrie's* 12-inch turret.—*La Vie Maritime.*

During May the French fleet held its record firing off Toulon. Division firing was done first, the divisions passing at distance of 9000 meters. An evolution was executed during the firing on signal of the admiral. The results obtained were reported as very satisfactory. Single ship firing was done at 8000 to 9000 meters. Not an accident to matériel occurred, and guns and mounts are considered very satisfactory. The *Bouvet*, in the third squadron, did the best.

The third school of fire is this: Two targets are anchored 400 meters apart. The squadron in two homogeneous sections, two vessels each, is led by a guide at unknown speeds and courses. The range is about

9000 meters. On the first run the firing lasts nine minutes and is concentrated on one target. On the second run each ship takes one target. The firing lasts 14 minutes and is considered a severe test of the matériel.—*Moniteur de la Flotte.*

Scores were as follows:

FIRST SCHOOL OF FIRE.

		Hits.	Per cent.	Efficiency coefficient.
Voltaire	firing to starboard	7	22.6	11.7
	firing to port	7	22.1	9.7
Condorcet	firing to starboard	10	33	18.2
	firing to port	4	17.4	6.6
Danton	firing to starboard	18	52.9	31.2
	firing to port	7	24.2	15.7
Mirabeau	firing to starboard	6	19.4	10.1
	firing to port	8	20.5	14.6
Vergniaud	firing to starboard	2	11.1	3.3
	firing to port	7	25.9	11.7
Diderot	firing to starboard	11	30.6	12.4
	firing to port	13	37.1	21.5

The *Danton* did particularly well, in four minutes made 18 hits with 12-inch guns at 10,900 yards. It is evident that in a real action, the enemy's ship would have instantly lost all her maneuvering control.

SECOND SCHOOL OF FIRE.

		Hits.	Per cent.	Efficiency coefficient.
Voltaire	firing to starboard	15	33.3	16.7
	firing to port	12	30.8	11.7
Condorcet	firing to starboard	21	38.9	28
	firing to port	20	37.7	24.9
Danton	firing to starboard	13	31	15.2
	firing to port	22	48.3	27.5
Mirabeau	firing to starboard	9	17	14
	firing to port	16	30.2	23
Vergniaud	firing to starboard	4	9.3	4.5
	firing to port	14	31.1	15.6
Diderot	firing to starboard	14	29.8	16.4
	firing to port	7	16.3	8.3

During the second school of fire, the fire control was shifted from the primary position to the secondary position. In spite of this difficulty, the results are quite as good as in the first school firing, and ought to give us great faith.

The weather was generally good. The targets are considered very unsatisfactory, being destroyed by hits as a house of cards is blown down by the wind. Attention is to be given to developing a satisfactory target.

10,000 yards is considered the maximum target range.—*Moniteur de la Flotte.*

GREAT BRITAIN.—During gun pointers' tests off Lamlash, one of the pointers of the battleship *Collingwood* made a record. At a range of 2300 yards he made eight hits with eight shots from a 12-inch gun in 2 minutes. The best up to that was that of the *Orion* which made eight hits with eight shots from a 12-inch gun in 2 minutes and 8 seconds.

The *Orion*, before the King, carried out a battle practice, consisting of 28 rounds—four broadsides,—with her 12-inch guns resulting in 21 hits at 6000 yards in very foggy weather.

MARINE ENGINEERING.

BOILERS FOR NEW FRENCH BATTLESHIPS.—The Delcassé commission on boilers for the French Navy have decided to fit in one of the new battleships, the *Lorraine*, small tube boilers, the Guyot DuTemple, while her two sister ships, the *Bretagne* and *Provence*, are to retain the large tube boilers, Belleville and Niclausse, respectively.

OUR FIRST NAVAL OIL ENGINE.—The design of the New London Ship & Engine Co. for submarine tender No. 1, the *Niagara*, has been accepted by the Navy Department and to that concern has been awarded the contract for her construction at a cost of $492,930. The vessel will be equipped with a heavy oil internal combustion engine of the Diesel type and will be the first navy vessel to have such an engine installed, with the exception of the submarines themselves. In European countries this engine is used in merchant ships and in foreign navies in torpedo-boat destroyers and larger ships.

The turbines of the English cruisers *Amphion* and *Fearless* are of an entirely new design by the Parsons Marine Steam Turbine Company. These cruisers are to have a speed of 25 knots. The type referred to is the Parsons' combined impulse and reaction type of turbine, which was first ordered for the armored cruiser *Amphion*, a class of vessel larger than the *Scout*. The *Fearless* is also to be fitted with the combined impulse and reaction turbine, as well as another vessel of this class, the *Nottingham*, which will shortly be laid down at Pembroke, where most of this new cruiser class are being built. The number of propellers for these combination turbines has been reduced from four to two, but the vessels are designed to attain a speed of 25 knots per hour with 18,000 horse-power engines. The vessels are armed with ten 4-inch guns of the latest pattern and carry 350 tons of coal which gives them a very large radius of action at economical cruising speed. The new ships of the class are to have light vertical armor as well as protective decks of the turtle-back design. Their debut is looked forward to with much interest in naval circles.—*United Service Gazette.*

The French Admiralty is studying a system of turbo-reciprocating engines for the *Bretagne* type of battleship.

WOBBLING OF AMERICAN ENGINEERS.—It is curious that our cousins across the Atlantic cannot make up their minds concerning the relative merits of the turbine and reciprocating engines for their warships, as Americans have always been considered a very practical set of men, so that this policy of wobble is all the more incomprehensible. Moreover, it follows upon a long series of experiments carried out by American engineers, to settle this very question. We all remember the long ocean cruise of two sister battleships, and the subsequent decision that no more American warships were to be fitted with turbines. But now we learn that the battleship *Nevada*, whose keel has just been laid, is to have an installation of Curtis' turbines, while her sister ship, the *Oklahoma*, is to be driven by triple expansion reciprocating engines. Both ships are to use oil fuel only, and no coal will be carried either for main or auxiliary purposes, while the estimated speed is to be 20½ knots. At no point does the practice of the American and British designers differ more than in the driving department, for every British warship, from super-*Dreadnought* to submarine, is now fitted with turbines, the reciprocator having been finally and definitely abandoned so far as new construction is concerned. The development of the turbine is, in fact, a marked feature of our naval engineering, and our ships are now run by this type of machinery, without hitch or falter, year after year with economy and efficiency. The *Nevada* and *Oklahoma* will each displace about 27,500 tons, which is 500 tons larger than the preceding *Texas* class,

and so the many eggs in one basket policy continues its insane course in America, as in other shipbuilding yards in spite of the lessons of the *Titanic* disaster and all other dangers and difficulties.—*United Service Gazette.*

COMPLETION OF THE VOYAGE OF THE "SELANDIA."—This vessel, described on page 798 of No. 142 of the PROCEEDINGS, has just returned from her first round voyage which was of 21,840 miles. The *Engineer* has this to say of her trip: No defects whatever of a mechanical nature were developed and the officers of the vessel are satisfied with her performance. The piston rings and cylinders were found to be perfectly clean; the exhaust valve needed but regrinding and cleaning. 9300 tons of cargo can thus be carried nearly 22,000 miles on a consumption of but 9 tons of fuel for each day of 24 hours. This was done with an engine-room force of ten men and three boys.

MOTOR-DRIVEN WARSHIPS.—At last we are within sight of the first all-motor-driven warship for the British fleet, Messrs. Thorneycroft, the famous torpedo-boat builders, having offered to construct a new destroyer fitted with the Diesel engine, to burn crude oil. The Admiralty have accepted the offer and have placed an order for the vessel to be built. Our prediction, therefore, that the British Navy would introduce motors for main engines through the torpedo craft, just as turbines and oil-fuel and water-tube boilers were introduced, has turned out to be correct. That will-o'-the-wisp—the motor battleship—which enterprising and imaginative lay journalists have been chasing any time the last two years, will therefore remain grist to the conjectural pens, until marine engineers produce something more substantial with which we can begin main-engine motor experiments in our war fleet. The merchant fleet is ahead of the sister service, for it already has several large vessels, with considerable cargo carrying capacity, fitted with motors to drive their main engines. The projected destroyer will be one of the largest in our flotillas and will form part of the 1912-13 destroyer-building program. She will be fitted for cruising and performing all the functions of an ordinary vessel of this description, and will probably be constructed at Thorneycroft's new works at Southampton. Her progress will be watched with interest, although little doubt is felt in naval engineering circles as to the absolute success of the experiment, since the firm has already had considerable experience in motor work.—*United Service Gazette.*

In large powers a Diesel engine propelling equipment for a vessel costs something like 60 per cent more than the equivalent steam equipment, but it will occupy only 60 to 80 per cent of the space required for the latter, and the cost of fuel will be somewhere in the neighborhood of 30 to 40 per cent of the cost of coal. When the tremendous pressures and temperatures which are being dealt with in a Diesel engine, and the very fine adjustments which are necessary, are considered, it will be realized that it cannot be a cheap engine to build. Undoubtedly it will become cheaper than it is at present when more experience has been gained, but conservative shipbuilders consider it would be the greatest mistake possible to sacrifice anything, in either material or workmanship, for the sake of reducing the cost.—*Shipping*, Illustrated.

RUSSIAN OIL-ENGINED CRUISER.—The 3500-ton cruiser *Ruenda* should be finished in June. For some reason that is not apparent she is to have an electric reversing system, which, although used in the Amur River gunboats, was discarded in the Caspian Sea gunboats that were finished last year. The "inspection ship" building at the Nicolaieff yards should have been turned over in 1911, but she has been delayed. Her engines are of 750 horse-power, and those of the *Ruenda* are of 1200 horse-power. A floating workshop, 132 feet long, 28 feet beam, and 7¾ feet depth, is one of the most interesting jobs in hand, although she will be driven by a motor of

not more than 180 horse power, with auxiliary machinery of 30 horse-power. Bracketed with her in point of interest is a dredger with a main engine of 370 horse-power and 60 horse-power auxiliary. She is for the Black Sea, the workshop is for the *Neva*, the "inspection ship" for the Black Sea, and the *Ruenda* for the Baltic.—*Shipping*, Illustrated.

Tenders have been received by the English Admiralty for the construction of an oil-carrying ship of about 10,000 tons dead weight. She is to be driven by internal combustion engines of about 740 horse-power. This will be the fourth oil-tanker owned by the Admiralty, the others being the *Burma* of 3445 tons, the *Petroleum* of 9900 tons, and the *Isla* of 980 tons. She will be the first fitted with the new type of propelling machinery.—*United Service Gazette.*

SUPERHEATED STEAM.—Generally with steam turbines of modern design and carrying from 175 to 200 pounds of steam pressure there is a saving in steam consumption of about 1 per cent for each ten degrees of superheat.

The official trials of the *Kansas, New Hampshire, South Carolina* and *Michigan*, showed, by comparison, an average of 18.52 per cent economy due to superheaters.

A superheat of 100° or higher caused trouble with the valves, and fittings made of composition and cast iron. This is stopped by use of cast steel and valves with seats of bronze with a large percentage of nickel or monel metal.

The use of superheated steam up to 100° can be used with great satisfaction so far as practical service is concerned, with a decided increase in thermal efficiency.—W. M. McFarland in *International Marine Engineering.*

ROTARY AIR COMPRESSORS.—The following advantages are claimed for the rotary compressor driven by a turbine: It enables exhaust steam from other engines to be used either in mixed or low-pressure turbines; it gives a continuous delivery of air; occupies comparatively small space; and requires light foundations under which the condensing plant may be placed; it requires only a small amount of oil for lubrication and the air is delivered free from oil—a feature of importance when the air is required for some chemical purposes.—*The Engineer.*

TURBINE-DRIVEN PUMPS.—In a paper read before the American Society of Mechanical Engineers, Mr. A. G. Christie points out that the steam turbine is an ideal source of power to drive centrifugal pumps, especially when it is necessary to lift against high heads. Hence it has been used in several places for city fire service, using lake or river water in high-pressure mains. The efficiency of such centrifugal pumps usually ranges from 65 to 80 per cent, so that, in spite of the high efficiency of the turbine itself, the combined set will not give as good economy as a high-grade reciprocating pumping engine. However, its first cost is low, it requires no internal lubrication, takes up very little floor space, and has no valves to require examination or renewals.—*Engineering.*

SIR WILLIAM WHITE ON MARINE PROPULSION.—Personally, remarked Sir William, he had long held and expressed the opinion that there was a great field for the use of internal combustion engines in ship propulsion, especially in vessels of moderate dimensions or moderate engine power. On the other hand, as a diligent student of information made available to engineers and naval architects, he had been convinced that, up to date, there continued to be very serious difficulties in the way of constructing oil or gas engines which should develop great power in individual cylinders. It was well known that experiments in that direction were in progress, and it might be admitted that difficulties of this nature existed only to be attacked, and if possible, to be overcome by engineers. On the other hand, it could not be denied that these difficulties had not yet been overcome, and

that engineers responsible for the design and construction of marine engines of the new types had hitherto found it safer to use comparatively small cylinders, and a large number of such cylinders in order to reach the very moderate aggregate power as yet applied in sea-going motor-driven vessels.

No one could have visited the *Selandia* or *Jutlandia*, continues Sir William, without being impressed by the multiplicity of cylinders and valve gear for a total development of 2500 horse-power especially when one remembers what such multiplicity involves during continuous running over long distances. Every one familiar with turbine-driven vessels of very great power would have been struck with the great contrast between their engine rooms and that of the *Selandia*. Engineers who had been in charge of steam turbines would not be eager to return to reciprocating engines whether they were actuated by steam or oil.

The Practical Advantages of a Rotary Engine were undeniable as well as considerable. If these advantages could be retained in association with equal or less fuel costs and no less freight-earning capacity than were attainable with internal combustion reciprocating engines—and the facts stated by Sir Charles Parsons and Mr. Walker in regard to the use of geared turbines seemed to establish that possibility—it was reasonable to anticipate that the oil engine would not have such a "walk over" in the contest with steam engines as popular journalists—not practical engineers—had predicted. One thing was certain: shipowners would be guided by commercial considerations rather than by sentimental; and they would not be desirous of accepting avoidable risks. It was a matter for congratulation, therefore, that the first experiments with new, and necessarily rival, systems of propulsion should be made on a moderate scale. Experience with cargo steamers already in service, or about to be employed, would settle many questions on which, at present, there was room for difference of opinion, and would lead to further advance in those directions which proved to be most promising.

Impracticability of Singular Solution.—One prediction might be made confidently; the complex and varied problems of marine engineering did not permit of any one or singular solution being found; no system of machinery could prove to be the best for all cases which occurred in practice; sudden or sweeping changes such as had been declared to be imminent of late were impossible. This discussion would have served a useful purpose in making clear both the present position of affairs and the directions in which advances would be made in the immediate future.—*Page's Weekly.*

PROPULSION FOR WARSHIPS.—As might be expected, each method of propulsion thus far tried has difficulties and objections peculiar to it, but steady progress is being made, and probably it will not be long before a satisfactory solution will be evolved. It appears to me that at present for vessels carrying the whole or a large proportion of their fuel supply in the form of oil, as do our most recent battleships, the ideal solution would be to fit Diesel engines or the equivalent, driving generators, which in turn drive motors upon the shafts; this installation, however, to be of low power, adapted to drive the ship about ten knots only. For higher speeds turbines and boilers would be relied upon.

Such an arrangement would be slightly heavy as regards weight, but would have the advantage that the endurance would be doubled at cruising speed, and an entirely independent means of propulsion would be provided, giving reasonable insurance against breakdowns. It would also be a step towards the generally anticipated use of the oil engine only for propulsion.

Such an installation would involve some difficult engineering problems, but I know of no reason why they could not be satisfactorily solved.—Naval Constructor D. W. Taylor, U. S. N., in "Recent Advances in the Art of Battleship Design," in the Journal of the Franklin Institute.

RADIO.

The Marconi Wireless Co. will soon start the construction of the two largest wireless stations in the world in San Francisco. The company's plants include an immense system of wireless stations, reaching across the Pacific from San Francisco to the Philippines, with high-power transmitting stations at Honolulu and on the coast of China. This means that the Marconi wireless system will enter into active competition with the Pacific Cable. It is also announced that the Marconi Co. will install a 500-kilowatt station at Panama. When the stations in San Francisco and the one in Manila are completed, direct communication between these points, a distance of 6962 miles, can be sustained without interruption. With the high-power wireless stations at San Francisco, Honolulu, China, Manila and Panama, any ship in the most remote part of the Pacific may possibly be reached almost instantly.—*Shipping*, Illustrated.

WIRELESS TELEGRAPHY IN PERU.—Wireless communication has been established between Lima and Iquitos, across a vast stretch of the Andes, without the use of intermediate stations.

Radio messages were sent from an aeroplane by Lieut. B. D. Foulois, U. S. A., to the Aviation School at College Park, Md., on August 6, 1912, a distance of twelve miles. The sending key was attached to a lever and worked satisfactorily. This is the first really successful use of radio from aeroplanes.

WIRELESS BILL BECOMES LAW.—Congress recently passed a bill requiring any United States or foreign vessel navigating the ocean or the Great Lakes and carrying fifty or more persons to be equipped with wireless apparatus capable of operating for a distance of at least 100 miles by day or night, on and after October 1, 1912. An auxiliary or emergency energy supply is required capable of operating the sending set for at least four hours. The wireless equipment must be in charge of two or more skilled operators, one of whom shall be on duty at all times. The bill does not apply, however, to vessels plying between ports less than 200 miles apart.

On July 23 President Taft affixed his signature to this bill and it thus becomes a law. So far as the act relates to the Great Lakes it takes effect on and after April 1, 1913, and in respect to ocean cargo steamers it becomes effective on and after July 1, 1913. Provision is made that on cargo steamers the second operator may be replaced by a member of the crew who is competent to understand and receive distress calls and assist in maintaining a constant wireless watch so far as needed for the safety of life.—*Electrical World*.

PROCEEDINGS OF THE LONDON WIRELESS CONFERENCE.—The International Wireless Telegraph Conference which convened in London on June 4 was formally adjourned on July 5. The conference revised the regulations governing the exchange of messages between ships and shore. The new convention and the revised regulations were signed by the delegates of all the countries represented—about thirty in number. The conference gave special consideration to the use of wireless communication for the relief of disasters at sea, and, after full discussion, unanimously adopted a resolution for compulsory wireless equipment on shipboard, the text of which is as follows:

"The International Radiotelegraphic Conference, having examined the measures to be taken with the view of preventing disasters at sea and of rendering assistance in such cases, expresses the opinion that, in the general interests of navigation, there should be imposed on certain classes of ships the obligation to carry a radiotelegraphic installation.

"As the conference has no power to impose this obligation it expresses the wish that the measures necessary to this end should be instituted by the governments.

"The conference finds it important, moreover, to insure, as far as possible, uniformity in the arrangements to be adopted in the various countries to impose this obligation, and suggests to the governments the desirability of an agreement between themselves with a view to the adoption of a uniform base for legislation.

"Lastly, the conference recommends to the governments the desirability of establishing in each maritime country a number of coast stations with a permament service adequate for the needs of navigation."

The new regulations contain a number of provisions designed to increase the effectiveness of wireless communication at sea in cases of emergency or danger. Ships in the future will be required to provide an auxiliary or independent source of energy capable of working the wireless apparatus for at least six hours. The emergency installation must be located in a secure position on shipboard and must be so completely independent that any accident to the ship's engines will not interrupt the energy supply for wireless communication. On ships of the first class a permanent watch will be required and at least two fully qualified operators must be carried. On ships of the second class, where a permanent watch is not considered feasible, the operator will be required to listen during the first ten minutes of every hour. In the smallest ships, such as fishing boats, no regular periods of watch have been prescribed. Each government in issuing licenses to carry wireless equipment will determine in which class any vessel belongs.

Rules have also been made requiring both ship and shore stations to suspend work and listen at the end of each quarter of an hour in cases where it is likely that distress calls otherwise might not be heard. In order to prevent future confusion a ship in distress will have control over the working of all stations in its vicinity and operators on every ship will be placed specifically under the authority of the captain. The transmission of weather reports to vessels at sea will be given priority and coast stations will be supplied with weather forecasts for communication to ships when called for.

At the Berlin conference regulations were adopted requiring ships to communicate with the nearest shore station, as a means of preventing confusion in working. Numerous proposals were advanced for modifying these regulations so as to allow communication between a ship and some remote shore station. After discussion a new regulation was adopted which permits such communication when a special wave-length of specified dimensions is employed; but this provision applies only to communications between a ship and a shore station of the same nationality. Since the transmission of radiotelegrams between ship and shore by means of one or more intermediate ships is becoming more frequent, the convention adopted regulations in reference to charges, accounting, etc., for facilitating this service.

All the countries concerned have now agreed that all ships should be under the obligation of communicating upon call with one another regardless of the wireless system employed. The convention decided that it is premature to attempt to prescribe regulations affecting long-distance service between land stations, and it was expressly agreed that each country ought to remain free to organize such land service as it deems necessary, subject only to the restriction that interference between different stations must be avoided as far as possible and that differences in the system of wireless telegraphy employed must not be a basis for refusing intercommunication. The American delegates conveyed to the convention an informal invitation to hold the next conference in Washington, D. C. This invitation was unanimously accepted, and the date of the next conference was fixed for 1917.—*Electrical World.*

AERONAUTICS.

AVIATION. A SHORT DESCRIPTION OF THE PRINCIPLES OF HEAVIER THAN AIR MACHINES.—Leaving aside Icarus and Phæton, and other mythological heroes, and the well-meaning cranks of the early nineteenth century, the first man who proved of any real use to modern aviation was the wonderful

Lilienthal. He pursued his remarkably accurate investigations on the effect of the resistance of the air against a moving curved surface, or rather a moving curved inclined plane, if we use plane in the sense of plane in aeroplane. But besides these investigations, absolutely essential to the designing on a aeroplane, he successfully launched himself from the tops of hills and mounds into the air against the wind in what are called gliders, that is, aeroplanes without engines, making over two thousand flights, and of course giving to the whole world the benefit of his experiences. He was killed by falling only 50 feet in 1896, just as he had started to fit an engine of 2½ horse-power, which just managed to flap its wings, but at the same time considerably extended his flights. Pilcher, an Englishman, was killed in the same way. Langley, an American, was another great pioneer; his investigations on the resistance of the air were almost perfect, but only concerned the flat inclined plane, and this was soon discovered to be more or less useless for an aeroplane.

Langley eventually evolved a machine called an aerodrome; the models were very successful; he received a grant of $50,000 from Congress, but the man-carrying apparatus failed by a mischance, and he died shortly afterwards of a broken heart.

Chanute was the predecessor of the Wrights, and built a machine practically the same as theirs, and the prototype of the present biplane. He started gliding experiments, which were carried on and perfected by the Wrights.

Sir Isaac Newton was the first to usefully investigate the resistance of the air against moving surfaces, and he worked out the universal and well-known law that the resistance is proportional to the area of the surface and the square of the velocity.

At first we will assume that we have a simple plane proceeding at a given speed, say 60 miles an hour, and inclined at an angle of incidence of 5°, we should also choose a curvature of about $\frac{1}{12}$, all these assumed dimensions being those found practically best. Now as the air strikes the plane more or less at right angles to its chord, it can be resolved into two forces at right angles to each other; the horizontal one tries to counteract the thrust of the propeller, and the vertical one expends itself in lifting the plane. The horizontal force is called the drift, and the vertical one the lift. In working out these problems the lift must always equal the maximum weight of the machine, and this will enable the machine to just fly, and providing the velocity can be increased by means of a more powerful engine, the machine will climb. From intricate formulæ for inclined curved surfaces we find the necessary area of the surfaces, say 216 square feet, and we decide on a monoplane of a span of 36 feet, and a depth of 6 feet, a good proportion. We now know that if we fit on an engine to this of enough power (provided the total weight does not exceed the lift), and turn it on, it is bound to rise in the air.

There are, however, two other main factors remaining for safe and practicable flight, even in a straight line, and up to date we have not considered anything other than a straight flight. These two factors are longitudinal and lateral stability. First consider longitudinal stability; we have this single plane curved $\frac{1}{12}$, width 6 feet, gradually rising owing to the pressure of the air acting against the curved surface. This pressure may be considered to act at one point, the Center of Pressure, in the same way as the weight of an object acts at one point, called the center of gravity. The position of the center of pressure depends upon the angle of incidence of the plane to the air current, and of course this is liable to alter during flight. Allowing that in the simplest form of machine, as the simple plane in consideration, the center of pressure coincides with the center of gravity, though it need not necessarily; any alteration in the position of the center of pressure would immediately cause instability, the lift working, say, too near the front; the plane would then turn over and of course capsize; to counteract this a tail is put on at a good distance from the front—roughly

the total overall length is equal to the span—and another similar inclined plane of a small size is attached to the end of this tail. Of course there is a similar lift acting on this plane at its center of pressure, and by means of a lever operated by the pilot, any alteration of the center of pressure in the main plane can be balanced by altering the center of pressure at the tail. The tail acts as a lever, and the small lift at the tail does sufficient work, being at a greater distance. This small surface at the tail is usually called the elevator, as by its means the aeroplane is lowered or raised at the operator's desire during flight, although its main object has already been described.

Nearly all monoplanes have only a tail elevator, but the Bregnet, Avro, Goupy biplanes are also of this type. The tendency is to do away with a front elevator. The front elevator is a familiar object in the Wright, Farman, Bristol, and nearly all of the early biplanes, where the center of gravity is in front of the center of pressure. The Valkyrie is about the only successful monoplane with a front elevator.

The most baffling problem of the early days of aviation was that of lateral stability. The Wrights deserve practically the whole credit for discovering the means of ensuring this, and it is their only important patent.

They placed movable wing flaps or ailerons at the ends of the planes, and in flight of course these hung out straight in line with the rest of the surface. If the aeroplane tilted to the right, all that was necessary was to pull down the right ailerons, the right wing then catches, as it were, more wind pressure, and rises again. At the same time the left ailerons are raised and less pressure is experienced on the left wing. The other method, perhaps in more general use in nearly all monoplanes, such as the Bleriot, Morane, R. E. P., and some biplanes such as the Bregnet, is warping, *i. e.*, actually pulling up and down the wing tips, which are otherwise more or less rigid.

The only other essential detail is the means of directing, and this is very simple. It is done by means of one or more vertical rudders placed nearly always at the tail, and worked in exactly the same way as the rudder of a boat.

The arrangement of the controls is very varied in the different types, but is often as follows:

The direction rudder is worked by the feet in the same way as a tiller, the elevator is controlled by a lever which actuates it, if moved from front to rear. This lever is on a universal joint, and if moved sideways actuates the ailerons or warps the wing tips. In the latter case, at the end of the lever is a steering wheel as in a motor car and warping is done by turning the wheel, and elevating by pulling it to the rear, and depressing by pushing it forward.

It is often necessary to do these three things together, the three dimensions of the air, of course, bothering the absolute novice not a little. The propeller works exactly as the screw of a steamer. It can be placed in front or behind the main planes. If in front it is usually called a tractor screw. Great difficulty has been experienced in getting the best form of aerial propellor to do the most efficient work, and our knowledge of the subject is at present very small.

The biplane has a much bigger lift than a monoplane, and can consequently carry more weight. Although up to a certain extent by increasing the span of the monoplane large weights can also be carried. The biplane with a monoplane tail is rightly coming into fashion.

Of the various motors the Gnome rotary engine has been found to be the most reliable up to date. However, there are many disadvantages in a rotary engine, and there seems plenty of opportunities of perfecting the stationary engine of which there are many excellent ones such as the Renault, R. E. P., and Canton Unué, of foreign make, and the E. N. V. and Green which we produce at home.—From an article by Lieut. T. H. Sebag-Montefiore, R. F. A., appearing in *The Journal of the Royal Artillery*.

SCOTT PROJECTILE DROPPING DEVICE.—The bombs weigh 18 pounds and are released in pairs. In setting the sight the altitude, forward speed, and weight and shape of projectile are considered, and are worked out so well that in March, 1912, in France, Mr. R. E. Scott, late first lieutenant, U. S. Coast Artillery, obtained these results:

Target was 65 feet in diameter.

From a height of 650 feet the projectiles fell to within 4.9 feet and 6.5 feet of the center of target.

From heights above 3280 feet, the projectiles fell out of the target, but were in line with its center.—*Aero Club of American Bulletin.*

BOMB DROPPING IN FRANCE.—The French officers are experimenting with dropping bombs from aeroplanes, and find that this is more difficult than may be at first supposed. The object is to drop bombs of 15 pounds weight from a height of 600 feet and to place them in a target of 60 feet diameter. Lieut. Mailfert piloted the aeroplane on one occasion, with Capt. Conade attending to the bombs. Another aeroplane was piloted by Lieut. Bousquet who also operated the dropping device placed under his seat. The weather was somewhat rough, and they found that a slight wind gust was enough to send the bomb off the target. For instance, Lieut. Mailfert, who according to the regulations was obliged to drop 15 bombs in 50 minutes, took 38 minutes 11 seconds to pass 15 times over the target at 600 to 750 feet height, but he rarely succeeded in placing the bombs in the target, this being only two or three times. From this it will be seen that the matter will require considerable practice, but as these are among the first experiments there is no doubt that the future will see much closer work.—*Scientific American.*

HYDRO-AEROPLANES.—As fresh experience is obtained with the use of aeroplanes it is seen that their scope for military purposes is much more restricted than had been expected. The "fifth arm," as the aeroplane is called in France, will, of course, render invaluable service for scouting work, but it has so far proved a failure as a fighting machine. Imagination at first ran riot with the aeroplane, which was to become a deadly arm of attack by dropping explosives on a helpless enemy, but it is found to be far from an easy matter to drop explosives at a required point with any chance of doing execution. To be safe from shots and shells the machine must fly at a height of at least 800 m., and it is obviously impossible to drop explosives on small masses of troops, except by accident when the aeroplane is flying at such a height at a necessarily great speed. For the moment, therefore, the aeroplane is regarded solely as an instrument for reconnoitring, and, as nothing further can be done, interest is being centered specially in the machine adapted for taking its flight from water. Experiments with hydro-aeroplanes can be carried out much more safely than with aeroplanes, and the conditions of flight being much the same the hydro-aeroplane will be developed with a view, at the same time, of improving the aeroplane. So far it must be admitted that the toll of lives has been much too heavy for the small progress made with the aeroplane during the past year.—Editorial in *The Engineer.*

TWO-POWER UNITS FOR AEROPLANES.—The navy has just taken over a new triple tractor propeller twin engine hydro-aeroplane made by Messrs. Short Brothers, to fulfil certain requirements laid down by the Admiralty. The power consists of two revolving seven-cylinder Gnome engines, each of 50 horse-power, the weight of the machine being 1800 pounds, yet its efficiency is such that at need it can continue flying with only one motor working. Tried for speed with both engines, the aeroplane did 62 miles an hour; she can carry four people, with petrol and oil, for seven hours. Her over-all length is 38 feet, and the maximum span from one extremity to the other of the upper wing, which is larger than the under one, is 50 feet, the gap between the two planes being 7 feet. The central propeller is

driven direct from the engine, and the two side by side screws immediately in front of the main planes are driven by chains. All flying wires are doubled, and the factor of safety all round is ten. The pilot has an unusually clear view ahead of him. The floats, or pontoons, each weigh 214 pounds. The vessel is designed to stand buffeting about in an eight-foot sea-way, and that she will do so easily may be judged from the fact that the other day, with an earlier and smaller Short-built monoplane, having only one motor, which temporarily failed, Commander Samson, R. N., drifted approximately 34 miles while the wind was blowing from 25 to 30 miles an hour. Having no telegraphic apparatus on board he was 5½ hours before being picked up, yet the little machine was no worse for the enforced trial. It is occurrences of this kind, however, which have determined the Admiralty policy of having no more aeroplanes with single power units, but only those with two or more motors, so that if one goes wrong at least some proportion of motor power is always available.—*United Service Gazette.*

THE AVIATORS' LIFE PRESERVER.—The provision of a practical life-saving apparatus would come as a great boon and encouragement to the aviation science. The dangers of aerial service, though fearlessly met by our officers and men, should be guarded against in every possible way. We believe that there is such a valuable adjunct to the flying machine, and that it is the outcome of the study of a former Russian artillery officer named Kotebinkoff. Its main idea is as follows: a box containing the parachute is strapped on to the shoulders of the aviator, and is connected with the aeroplane or other flying machine by a string which snaps under a slight tension, thus opening the box automatically and releasing the parachute which springs into the air and inflates or gathers its power. The total weight is reported to be only 18 pounds. The parachute is made of strong wefted silk and its area when extended covers 50 square meters. In conducting the experiments with this apparatus, life-size dummies were dropped out in varying positions, head first and otherwise, and it is reported that in all cases a drop of fifty or sixty feet was sufficient to extend the life-saving apparatus and reduce the rate of descent to 1.60 meters per second. It seems to us that if a clearance from the disabled or falling air machine can be assured, this invention is one that deserves the closest scrutiny by our aeronautical experts.—*United Service Gazette.*

MILITARY USE OF AEROPLANES.—Capt. Sykes gave some interesting details of the employment of aeroplanes in the operations of Tripoli. The salient lesson learned by the Italians was the unsatisfactory and inconclusive results obtained from dropping bombs, an operation which at present involved even greater danger to the pilot than to the enemy.

Col. Holden said that during the German maneuvers last year extensive experiments were made in reconnoitring from dirigibles. The most interesting result was to establish the fact that bodies of troops and guns could be simulated with the greatest ease by simply turning up the earth to the required shape. In these conditions it was impossible for the airman to distinguish between the false and the true.

Col. Seely emphasized the immense importance of variable speed and of automatic stability. Speaking in the same hall a few months ago, Prince Louis of Battenberg had pointed out that the navy needed hawks, web-footed hawks, able to hover over land and sea. But the hawk possessed one quality that the aeroplane lacked—it was able to hover. Let them produce an aeroplane that could hover, perfectly silent, invisible, transmitting its news by wireless, and the whole of warfare would be revolutionized. We must be the foremost nation in the air, as we already were on the sea, but in striving for this object valuable lives must not be sacrificed.—*The Army and Navy Gazette.*

Great Britain has formed its military aviators into a corps, called the Royal Flying Corps. Entry to it will be ultimately confined to officers who have

graduated at the Central Flying School. Those officers will be drawn from all branches of the naval and military services and civilians. The rank and file will consist of warrant officers, petty officers, non-commissioned and men transferred from the navy or army and also of men enlisted directly into the Royal Flying Corps. After graduating at the Central Flying School officers will be attached, as may be necessary, to the naval or military wing for further training. The period of appointment in the case of officers who elect for continuous service with the naval or military wings of the Royal Flying Corps will normally be four years. The period of enlistment of enlisted men is four years, with re-engagement from year to year. A primary condition is that in time of war every member of the Royal Flying Corps shall feel obligated to serve in any part of the world. The corps will have a reserve divided into two classes, the first and second reserve. To belong to the former class it will be necessary to perform a certain number of flights, but in the second class no flights are requisite. The Royal Flying Corps will be maintained jointly by the War Office and the Admiralty. It is proposed that a permament consultative committee be appointed, to which questions in connection with flying shall be referred by the Admiralty and War Office. The Central Flying School will be established on Salisbury Plain. The naval wing of the corps will be for the present at Eastchurch, the site of the Naval Flying School. The corps does not comprise aviation alone, but embraces all forms of aeronautics, including kites. Until now it was the plan of the War Office to train only officers as fliers, but the scope of instruction will be widened to include non-commissioned. It is considered that the minimum number of trained fliers should be two per aeroplane. For seven aeroplane squadrons the following would be the division of the personnel: Commanders, seven officers, no non-commissioned; sergeants, seven; three sections, 84 officers, 84 non-commissioned; total officers, 91; total non-commissioned, 91. The reserve would be of the same number, so that 182 would be the combined total for officers and non-commissioned each. The old air battalion disappears by this new arrangement, being absorbed into the Royal Flying Corps. Great importance is attached to cross-country flying as part of the instruction of the corps, and arrangements will be made with private aerodromes for that purpose. To study better weather conditions in the upper air a meteorological expert is to be attached to the Central Flying Station. The above is the purport of a long memorandum recently issued by the British War Office as a Parliamentary paper.

THE NAVAL AVIATION SCHOOL.—The Admiralty have purchased 10 acres of land, adjoining the Royal Aero Club's Aviation Grounds, Eastchurch Sheppey, for the purposes of the newly formed Naval School of Aviation. Buildings, including officers' quarters, barrack accommodation for men, workshops, and sheds (which will be of a temporary character) are to be begun at an early date.—*Army and Navy Gazette.*

M. CROMBEZ' REMARKABLE OVER-SEA FLIGHT.—Recently M. Crombez, the Belgian airman, flew from Nieuport, in Belgium, to Calais, thence to Dover, and back to Nieuport without a stop, covering the whole return journey of 150 miles in 140 minutes. Nothing previously accomplished approaches this sensational feat in the significance of the impression it conveys to the average mind as regards the future possibilities of the flying machine; whilst the importance which will be attached to it by those who look at aviation solely from the military point of view can be readily understood. It should be mentioned that the machine used by M. Crombez was a Deperdussin monoplane, a type of aeroplane which is now right in the front rank for speed, reliability, and all-around efficiency.—*Army and Navy Gazette.*

A practical example of the use of hydro-flying machines for communicating with the fleet in the open sea near home ports was shown in the Bay of Spezzia recently. The new Italian *Dreadnought, Dante Alighieri,* left the

arsenal at 8 a. m. for her preliminary trials, which, it is reported, gave results considerably above the estimates. An hour later Captain Guidoni followed on his "idro-volant," and, after rounding Palmaria Island against a brisk wind, overtook the battleship, which was then going full speed for Portofino, circled round her several times, lowered his course to within a few meters of the bridge, saluted Admiral Patris, and returned to Spezzia, having flown 50 kilometers in 40 minutes.—*The Engineer.*

The experiments at Spezia with the Guidoni hydro-flying machine, referred to above were continued, and gave rise to some incidents of technical interest, as, for instance, the conveyance of a passenger at 50 m. altitude twice round the wide bay on a machine not in reality built for carrying extra weight, and the accident which was nearly the cause of the loss of the apparatus and its inventor. The *Dante Alighieri* had left in the morning for her final official speed trials, and having performed the run to Genoa, was returning at full steam, when the "hydro-volant" left Spezia, and, after joining the battleship near Cape Noli, accompanied her on her course, circling round her continually, as on the former occasion, till opposite Serravezza. At this point the machine suddenly gave a violent lurch, grazed the sea with the point of one wing, seemed to shake itself free for a moment, and then fell on its side. The accident, which was rendered a mere episode by the prompt salvage of both Captain Guidoni and his apparatus, was probably caused by the suction of the air produced by the passage of the *Dante*, then travelling at 24.5 knots through the water.—*The Engineer.*

REQUIREMENTS FOR NAVAL AEROPLANES.—They are required to carry, as a full load, two persons of a combined weight of 350 pounds, together with a wireless outfit and other instruments and supplies for a 4-hour flight. A maximum speed of 55 miles per hour must be shown as an average of ten flights—five with the wind and five against it—over a mile course, and 50 miles per hour throughout the 4-hour endurance test with full load. The latter test will be made over a 5-mile triangular course, the speed being determined by a recording anemometer. All machines must rise from the water in still air, with a run of not over 1000 feet; must climb to 1500 feet in one or more big spirals and in a given time (not yet determined), must turn without skidding, stalling or sliding, in a circle of 200 yards radius, and must glide from a height of 500 feet with power off a distance of 2500 feet in a horizontal direction. Air-cooled motors are preferred and an extra premium will probably be offered for a heavy oil motor or one using kerosene or alcohol. It must be arranged to be started from the seat by the pilot. The machines must be able to be hoisted on board ship intact and to be quickly disassembled. The hydroplane floats must have watertight compartments and means of draining readily. The aeroplane must be able to remain upright on the surface of the sea in a 20-mile wind when the motor is stopped.—*Scientific American.*

The war biplane built by the Wright Brothers for the Signal Corps has been tested at College Park, Md. One of the conditions is that the biplane shall fly not less than forty-five miles an hour, with 450 pounds on board, not including gasoline, oil and water, for four hours. In a test on May 21 it made an average of fifty-two and four-fifths miles an hour. The second test consisted in climbing 2000 feet with the same load in ten minutes, but in this the biplane failed on account of a stiff wind.

WHY AIRMEN ARE KILLED.—Major Roche, of the French Army, is responsible for the statement that 25 per cent of the accidents sustained by aviators are due to lack of natural aptitude, 25 per cent to poor construction of the aeroplanes, 13 per cent to insufficient training of the pilots, 13 per cent to a total misconception of the limitations of the aeroplane, from 10 to 12 per cent to atmospheric conditions, over which the aviator has no

control, and 6 per cent to sheer recklessness of aviators who go up without testing their machines or land on unfamiliar ground.—*Scientific American.*

MISCELLANEOUS.

THE LARGEST WARSHIP.—Although authorities differ as to the dimensions of the recently launched British battle-cruiser *Queen Mary*, there seems little reason to doubt that she is the largest warship afloat at the present time. Some authorities give her dimensions as follows: Length over all, 725 feet; beam, 87 feet; and displacement, 29,000 tons. She will probably make over 30 knots on trial, and to do this her turbines will have to develop not far short of 100,000 horse-power. The *Moltke*, of 23,500 tons approximate displacement, required 90,000 horse-power to drive her at from 29 to 29½ knots.—*Scientific American.*

PRECAUTIONS AGAINST COAL-BUNKER FIRES.—Research and investigation have now proven beyond all question: 1. That all coal gives off inflammable gas when freshly worked, and also when freshly broken, and that this gas becomes explosive when mixed with certain proportions of air. It is the evolution of this gas which requires the ventilation of the bunkers before entering them with naked light.

2. That heating of coal and the consequent risk of spontaneous combustion does not proceed from the presence of gas, but is caused by the absorption of oxygen from the air.

3. That this absorption, and the accompanying development of heat, is greater at high than at low temperatures, so that when once commenced it proceeds at an increasing rate if the supply of air is maintained.

4. That where heat is being generated by the absorption of oxygen it is probable that more gas will be evolved. The evolution of the gas, however, does not cause the generation of heat. Where such gas is being evolved, if sufficient supply of air is maintained to provide more oxygen than is being absorbed, an explosive mixture is formed amongst the coal.

5. To minimize the absorption of oxygen by the coal in reserve bunkers, or in any bunker in which men are not actually working, the lower doors should be kept absolutely closed, so as to prevent any current of air whatever passing through the bunker and into the mass of coals.

6. If there are any parts of bunkers in which, owing to the proximity of boilers, uptakes, or recesses through which steam pipes, etc., are carried, there is likely to be a higher than normal temperature, these parts should, if possible, be stowed with large coal, and should be worked out as soon as possible. The shoots should be arranged not to deliver small coal into these places.

7. Small coal, which accumulates under shoots, etc., should be worked out as soon as possible, and not left till the last.

8. If any coal is left in a bunker when a fresh charge has to be taken in, it should be trimmed into a position to ensure its being used on the next voyage. It cannot be too strongly impressed upon those responsible, that danger of overheating and spontaneous combustion increases with the length of time the coal remains in the ship.

9. Where bunkers are over gutterways, etc., special care should be taken that the limbers are tight. Several fires have originated in bunkers just over the limbers, and there is reason to suppose that they have been caused by air circulating through the coal and coming from the limbers.

10. There is no risk entailed by the coal being wet when put on board. In fact, in cases where coal is known to be of a fiery nature, it would be of an advantage for the small coal to be damped when charging the bunkers.

11. If heating of any part should occur where there is no traceable external source of heat to account for it, the heating will probably be local only in a part where the coal is small, and the surrounding portions may not be overheated. In attempting to obtain access to the heated parts for the purpose of applying water, special care is needed to prevent the action

taken from supplying the air which is needed to convert a heated zone into an actual fire.

12. Although some kinds of coal have proved to be more liable to spontaneous heating and combustion than others, it should be realized that all coal, even anthracite, is liable to these occurrences.—Extracts from report of the Chief Engineer Surveyor of Lloyds on Spontaneous Combustion of Coal, 1912.

THE BAGHDAD RAILWAY.—It is announced that Koweit will not be the terminus of the Baghdad Railway, and that the section, Baghdad-Basra, is to be proceeded with. Great Britain does not desire to obstruct its construction, nor has she ever done so. What we must prevent, at all costs, is the seizure of Koweit by the Turks, who have twice attempted to rob Sheikh Mubarak of his city. Once the Turks get inside Koweit's walls they can back up the *coup-de-main* with such military force from the Baghdad and Damascus Army Corps that the whole British Army in India could not take it again. Ships cannot sail over deserts, or even far enough up the Shât-el-Arâb to hurt a Turkish Army in the hinterland of Koweit. With this town in Turkish, or possibly unfriendly, hands, our prestige in the East would be gone. If the Baghdad Railway stops at Basra this danger is eliminated.—*The Army and Navy Gazette.*

CAPE COD CANAL PROGRESS.—When the delegates of the recent International Navigation Congress visited Cape Cod they were assured that this work would be opened to traffic during the winter of 1913, or at the latest in the spring of 1914. The canal will provide a 25-foot depth from Barnstable Bay to the 30-foot depth in Buzzards Bay, a distance of 12½ miles. The minimum width on the bottom will be 200 feet. The canal will enable ships to avoid the dangers of the stormy outside passage around Cape Cod, and it will shorten the distance from Boston for ships passing through Long Island Sound by 66 miles. Fifty thousand vessels of a total tonnage of 25,000,000 and carrying 500,000 passengers pass around Cape Cod every year, and the majority of this traffic, it is expected, will seek the shorter and more sheltered route.—*Scientific American.*

THE KAISER WILHELM CANAL.—Extract from a paper by Herr H. W. Schultz of Kiel.—The canal was cut during the years 1886 to 1895. The present canal, which was 61½ miles in length, had a breadth at bottom of 72 feet 3 inches and a depth of water of 29 feet 6 inches over a stretch of 41.25 miles from the Kiel end, increasing to 33 feet 9 inches at the North Sea end at Brunsbüttel. The water level corresponded with the mean level of the Baltic. The smallest section was 4445½ square feet. The breadth was increased at the bends by amounts varying from 0 for radii of 3000 m. to 52 feet 6 inches for radii of 1000 m. Lake Audorf, to the east of Rendsburg, served as a turning place.

At each of its ends the canal had two locks, which were opened only when vessels were to be passed through. The Brunsbüttel locks were used for draining the canal, and this rendered the extra depth at this end necessary. The locks were a necessity on account of the rise and fall of the sea level at each end of the canal. The level of the Elbe had reached a height of 17 feet 3 inches, and that of the Baltic a height of 10 feet 4 inches above the mean level of the canal. The canal was intended to accommodate vessels of maximum dimensions, 475 feet 9 inches by 75 feet 6 inches by 27 feet 10½ inches. The locks for these latter had available lengths of 492 feet 1 inch, widths of 82 feet, and depths on sill of 31 feet 5 inches in Holtenau and 32 feet 9 inches in Brunsbüttel. The locks could be used whether the level of the water outside were high or low.

The canal was crossed by two railway and road bridges, one at Grünental and one at Levensau, with arches of 137 feet 9½ inches in height above the water level, a one-armed railway swing bridge at Taterpfahl, two bridges of the latter kind at Rendsburg, a road swing-bridge also at Rendsburg,

and a pontoon swing-bridge for road traffic in Holtenau. The four swing-bridges at Taterpfahl and Rendsburg each had a clear width of 164 feet, and were operated hydraulically.

The canal served as main drain for a large part of the country crossed by it, the water flowing through the Brunsbüttel locks, which accordingly were opened to the Elbe at the ebb. The whole line of the canal was electrically lighted with incandescent lamps of 25 candle-power.

The canal employed 120 pilots and a number of assistant pilots, whose services were given to vessels at one-quarter of the net cost occasioned. A number of pilots undertook work on their own account. Pilotage of steamers and towage of sailing vessels were compulsory.

In 1910, 45,569 vessels of 7,580,000 net tons paid toll. Since 1896 the numbers had increased by 182 per cent, and the tonnage by 310 per cent. Most of the vessels were of small dimensions. The receipts had for the last few years somewhat exceeded the expenses.

The widening was rendered necessary by the increase in the sizes of war vessels. The alterations were to be made without hindrance to the traffic. The present locks could not be interfered with, and new ones had to be constructed of such a size that they would suffice even for future further enlargements of the canal. The new section was, in general, to have a breadth at bottom of 144 feet 5 inches, and a depth below ordinary water level of 36 feet. The area of section was thus practically doubled, and the surface breadth was increased from 216 feet 6 inches to 334 feet 8 inches. The widened canal would have ten two-sided sidings of from 656 to 1200 yards in length, and one one-sided one 1530 yards in length. The ordinary sidings had a bottom width of 219 feet 9 inches, and the one-sided ones a width of 292 feet. The four 1100 m. sidings, arranged as turning places, had bottom widths of 538 feet, the turning place itself in each case having a diameter of 984 feet. The quantity of ground to be removed, amounting to about 130 cubic yards, was considerably greater than that dealt with at the original canal construction.

The new locks had lengths of 1083 feet, clear widths of 147 feet 7½ inches, and depths over sill of 45 feet 2 inches at mean water level, and 40 feet 9 inches at low water in the Elbe. A reason for the great depth given to the locks was that they were thus enabled to take in damaged vessels. These new locks would be the largest in the world. The swing-bridges at Taterpfahl and Rendsburg and the pontoon swing-bridges at Holtenau had to be replaced by lofty new iron bridges, and the road swing-bridge at Rendsburg by a new one of greater span. The total cost of the widening operations had been estimated at about $55,000,000.—*The Engineer.*

OILER OR STEAMER?—German naval publications advocate the use of the term *oiler*, for vessels that have oil fuel. We have the terms steamer, steamship and the verb to steam, from the fact that steam is used in those ships. If adopted we would designate the steamer America as the oiler America if oil fuel is used, and, as some object to the use of the verb *to soil* and prefer to state the vessel *steamed for*, we would then use the verb *to oil*, and state that the *oiler America oiled* for such a port.—*Marine Rundschau*, by W. H. B.

ACCIDENTS DUE TO MILITARY CAUSES.—In the years 1909, 1910 and 1911 there were 103 such accidents, and they caused the death of 341 men and wounding of more than 510. The accidents seems equally divided during the years, and are as follows:

	Accidents.	Killed.	Wounded.
France	24	223	201
Japan	5	39	82
United States	13	20	16
Germany	12	15	35
England	9	..	..

Twenty-five accidents occurred during target practice on board ships, and 25 ashore. Seventeen took place when assembling ammunition.

Five guns were destroyed by the bursting of shells in the bore. Thirteen accidents were caused by improperly designed breech mechanisms, and four by accidental ignition of charges of powder.

Twenty-six accidents are due to imprudence, and 49 accidents are due to faults of matériel, amongst the latter the four most serious ones are those caused by spontaneous combustion of powders, amongst this last, four large war vessels, the *Aquidaban, Iena, Matshushima,* and *Liberté.* For 36 accidents the exact cause is unknown.—*Internationale Revue.*

LOSSES OF THE JAPANESE IN THE RUSSIAN WAR.—The official statistics of the Japanese Surgeon-General Mori allow us to at least see exactly the losses of Japan in killed and wounded during the war in the Far East in 1904-1905. These figures in no way agree with those given in the most important histories of that war. According to these exact statistics the total loss was 40,374 killed, and 134,221 wounded, being in all 174,595 men, of which at Mukden, alone, 70,059 men (16,404 killed and 53,655 wounded); at Port Arthur 43,973 men (11,360 killed and 32,613 wounded). The report further shows that the infantry lost more men than all other arms combined; its losses were ten times greater than those of the cavalry or foot artillery, and its dead about ten times that of the field artillery. The losses of engineers also were large, both in dead and wounded, because of the extraordinary persistency with which the Japanese returned continually to the assaults on Port Arthur. The high figures of losses in the medical corps (18 per cent) nearly equal to those in the cavalry is a proof of more of the courage with which they were led, even into disaster. The officers show a greater loss than the privates in the list of those fallen in battle; there are 120 per cent of officers to 90 per cent of privates.

That is a significant and typical fact for all modern war.—*Ueber die Gesamten Armeen und Flotten.*

The *Kangaroo,* the submersible or submarine boat carrier, described on page 807 of the PROCEEDINGS is now on her way from Toulon to Callao carrying the submersible *Ferre* of the *Laubeuf* type built by the Schneiders for the Peruvian Government. This boat was successfully taken on board and stored for transport on June 28. A complete description, with plans, is to be found in *Engineering* of July 19, 1912.

THE FIFTH OLYMPIC TRIUMPH.—At Stockholm, for the fifth time since the revival of the Olympic games, the United States has finished first in the international competition, on this occasion leading in points in all events and making a "clean sweep" of the track meet. In the opening games, held at Athens in 1896, Americans scored eight "firsts" against five for Great Britain, one for Greece and one for Denmark. At Paris, in 1900, we won seventeen of the twenty-three athletic events, and at St. Louis, in 1908, twenty-four out of twenty-six. Deplorable circumstances that did not tend to exalt the British ideal of sportsmanship attended the London games of 1908. Great Britain claimed the victory, partly because of her supremacy in pastimes like "miniature rifle shooting," whatever that may mean, yet in the track and field events, the contests in which the American team actually appeared, we won almost twice as many points as our English rivals. It would be quite fair to say that in all the sports that properly form a part of such a meet and by any fair interpretation of the laws of sport, we have carried off the honors from the beginning; and though at the Pan-Hellenic games, another international competition held at Athens in 1906, the American team was crippled by internal dissensions, we maintained the record of supremacy by winning eleven "firsts" against four for Great Britain, three for Greece and two for Sweden.

FINAL STANDING IN OLYMPIC MEET.—United States, 128; Sweden, 104; Great Britain, 66; Finland, 46; Germany, 34; France, 23; South Africa, 16; Denmark, 14; Italy, 13; Canada, 13; Australia, 13; Belgium, 11; Norway, 10; Hungary, 8; Russia, 5; Greece, 4; Austria, 4, Holland, 2.

In the track and field events the final standing is as follows:

United States, 85; Finland, 27; Sweden, 24; Great Britain, 14; Canada, 7; South Africa, 5; France, 4; Germany, 4; Greece, 4; Norway, 2; Hungary, 1; Italy, 1.

BOOK NOTICES.

"The Electric Propulsion of Ships." By H. M. Hobart, M. Inst. C. E. Published by Harper Bros. Price $2.00 net.

It has not been until quite recently that electrical engineers have recognized the fact that there may be a fairly wide field for the use of electrical machinery as a means of propelling ships.

The author says: "I have made serious efforts to acquire a reasonable knowledge of the broad aspects of the subject from the marine engineer's point of view. As an electrical engineer, it would be futile for me to attempt to assimilate the marine engineer's data in more than a very rough way, but I have sought to do this and to place my results before electrical engineers in ways which, I trust, may be useful to them. I believe I shall fairly conclusively show that the incorporation of suitable electrical methods in ship propulsion is commercially advantageous in many cases, and I shall try to roughly outline the limitations; that is to say, I shall try to indicate the boundary line between the appropriate and the inappropriate cases. With the wealth of data at the disposal of the marine engineers and with their close knowledge of many detail considerations, I am in hopes they, with the further aid of the data which I contribute in this treatise, will be able to still more clearly define these boundaries."

The following list gives the chapter headings:

I. Introductory.
II. The Size and Power of Ships.
III. The Energy Required per Ton Mile in Propelling Ships at Constant Speed.
IV. The Frictional Resistance of Ships.
V. The Momentum of Ships.
VI. The Speed and Efficiency of Propellors.
VII. Mechanical Speed Reduction for Steam Turbines.
VIII. Electrical Speed Reduction Gearing for Steam Turbines.
IX. The Use of Super Heated Steam in Marine Engines.
X. Electrical Gear as a Means of Improving the Load Factor.
XI. Internal Combustion Engines for Ship Propulsion.
XII. Alternating and Continuous Current Electricity for Ship Propulsion.
XIII. Some Systems of Propelling Ships Electrically.
XIV. The Alter Phase System for Ship Propulsion.
XV. The Durtnall System of Propelling Ships.
XVI. The Emmet System of Ship Propulsion.

The above quotations and list of chapter headings give a good idea of the scope of this book and of the problems attacked, although the author

might have rightfully added that he would set forth the results of his efforts in such a manner that it could be calculated to be of interest not only to electrical and mechanical engineers and naval architects but also to everyone who has anything to do with ships, commercially or otherwise.

The author quotes freely the opinions of acknowledged authorities on many of the points connected with the various elements entering into the subject under discussion, and the reader cannot fail to be impressed with the effort of the author to set forth the results of his investigations in a remarkably disinterested and unbiased manner.

Naturally no attempt can be made to cover every consideration that enters into the relative advantages and disadvantages of each proposed kind of ship propulsion that is discussed in this book of 162 pages but many of the salient points are touched on, so that even a lay reader may understand how much effort naval architects and engineers are now making to bring about changes that ought to increase the efficiency in propulsion of ships of the navy and merchant marine, and, on the whole, a perusal of this treatise leaves one with an increased appreciation of the wide range and complexity of conditions that confront those who are working in this field of invention and with an eagerness to learn the results of practical tests and applications of the various systems under development.

It is expected that important data will be obtained from the comparative performances of the three U. S. Navy colliers *Cyclops, Neptune,* and *Jupiter,* each of about 19,000 tons displacement and of 14 knots speed, similar except as to type of propelling machinery, the *Cyclops* having excellent reciprocating engines, the *Neptune* having Parsons' turbines and Westinghouse reduction gear and the *Jupiter* is to have turbo generators and induction motors built by the General Electric Company.

The Diesel engine, as a type of ship propulsion machinery, is now holding the attention of marine engineers to a marked degree and it now seems probable that the use of electricity for ship propulsion is going to depend, to a great extent, upon the success of the Diesel engine in fulfilling the requirements of reliability, reversibility, etc., demanded by large ships of high speed.

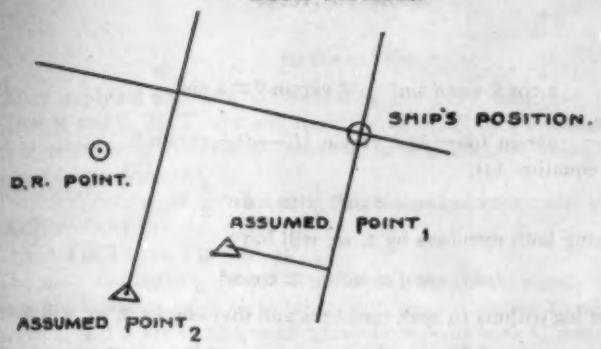
C. M. TOZER,
Lieut.-Commander, U. S. Navy.

"Altitude and Azimuth Tables."* Second Edition. By Lieut.-Commander Radler de Aquino, Brazilian Navy. Published by J. D. Potter, 145 The Minories, London, E. C., price $2.50 net.

This edition has some new tables added which comprise about 35 pages.

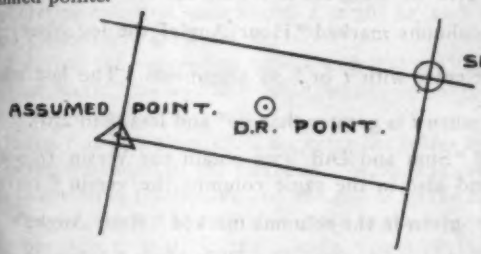
In explaining the use of these tables the author states that he, after mature consideration, prefers to use in solving, by means of tables, the specific problems of astronomical navigation an *estimated* point in place of an *auxiliary* point as a basis for calculating the determinative elements of lines of position (especially when 2, 3, or 4 stars are observed). In his book he names the points as follows:

* For an explanation of the use of these tables consult NAVAL INSTITUTE PROCEEDINGS, No. 128, December, 1908, Vol. 34, No. 4.



The assumed point is one found during the solution of the problem.

In the use of this second edition of tables he intends that *one* point shall be taken and the calculations made from that instead of having two assumed points.



The following matter is quoted from his descriptive pamphlet on the subject:

The simplification now introduced in the regular formula (actually used officially in the English Navy and already adopted by us in 1899 in our "The Method of Marcq Saint Hilaire"), permits the reduction of tables necessary to solve to *two* only and *avoids* the necessity of knowing the *auxiliary arco*, as happens in the tables of Martelli, Pouvreau, Bankos, etc., whose approximation is in many cases insufficient.

The determination of the altitude of a star with our tables is direct, which is not the case in those tables made especially for the calculation of the *hour angle*.

FORMULA V AND TYPICAL EXAMPLE.

When the hour angle of a star (t), its declination (d), and the lat. of the observers (L) are given, we will be able to find very rapidly and with great accuracy the altitude (h) of a star, as follows:

If, in the fundamental equation

$$\cos(90-h) \text{ or } \sin h = \sin L \sin d + \cos L \cos d \cos t, \qquad (1)$$

we should make

$$\cos t = 1 - 2\sin^2 \tfrac{1}{2} t,$$

we will have

$$\cos(90-h) = \cos(L-d) - 2\cos L \cos d \sin^2 \frac{t}{2}, \qquad (2)$$

or

$$1 - \cos(90-h) = \cos(L-d) - 2\cos L \cos d \sin^2 \frac{t}{2}.$$

If we make

$$2 \cos L \cos d \sin^2 \frac{t}{2} = \text{versin } \theta = 2 \sin^2 \frac{\theta}{2}, \quad (3)$$

we will have

$$\text{versin } (90 - h) = \text{versin } (L - d) + \text{versin } \theta. \quad (4)$$

Inverting equation (3),

$$2 \cos L \cos d \sin^2 \frac{t}{2} = 2 \sin^2 \frac{\theta}{2},$$

and multiplying both members by 2, we will have

$$\sec L \sec d \operatorname{cosec}^2 \frac{t}{2} = \operatorname{cosec}^2 \frac{\theta}{2}.$$

Applying the logarithms to both members and dividing by 2, we will have

$$\tfrac{1}{2} \log \sec L + \tfrac{1}{2} \log \sec d + \log \operatorname{cosec} \frac{t}{2} = \log \operatorname{cosec} \frac{\theta}{2}. \quad (5)$$

Then in accord with formulas (4) and (5) we are able to determine the altitude by means of our *New Tables.*

The first eight pages give us $\frac{1}{2} \log \sec L + \frac{1}{2} \log \sec d$. The 18 pages following give us in the columns marked "Hour Angle" the log cosec $\frac{t}{2}$ or log cosec $\frac{\theta}{2}$, when we enter with t or θ as arguments. The last nine pages give log cosec $\frac{t}{2}$ when t is greater than 90° and less than 270°.

In the columns marked "Sum and Diff." we obtain the versin $(L+d)$ or the versin $(L-d)$, and also in the same columns the versin θ corresponding to log cosec $\frac{\theta}{2}$ given in the columns marked "Hour Angle."

The corresponding altitude to vers $(90 - h)$ will be found below in the columns marked "Alt."

Each one of the versines and logarithms is multiplied by 10^6 to turn them into whole numbers. In this form characteristics do not appear.

TYPICAL EXAMPLE.

Feb. 21, 1910. 8h a. m. Lat. est.$=36°\ 52'$ N.; Long. est.$=8°\ 06'$ W. True alt. ☉ was $21°\ 07'$ at 21h 06m 11s by chro. slow 6m 59s on G. M. T. Required the est. alt.

C.$=$	21h	6m	11s		
CC.$=$	$+$	6	59		
G. M. T.$=$	21h	13m	10s		
Eq. T.$=$	$-$	13	46		
G. A. T.$=$	20h	59m	24s	or $t_G=$	$314°\ 51'$
				$G=$	$8\ \ 6$
				$t=$	$306°\ 45'$

$t=306°\ 45'$	$\left[\ \log \operatorname{cosec} \frac{t}{2}\ \right]$		34858		
$L=\ 36\ \ 52N$	$[\frac{1}{2} \log \sec L\ ]$		4845		
$d=\ 10\ \ 27S$	$[\frac{1}{2} \log \sec d\ ]$		363		
	$\left[\ \log \operatorname{cosec} \frac{\theta}{2}\ \right]$		40066	31709	(vers θ)
$L+d=\ 47°\ 19'$	.....		32205		(vers. $(L+d)$)
			63814		(vers. $(90°-h)$)
		$h=$	$21°\ 13'$		

EXPLANATION.

After applying the chro. correction to the chro. time, and the equation of time to the G. M. T., we will have the G. A. T. or T_G — the H. A. of the sun in relation to Greenwich, counted to the East, t_G being the G. A. T. *converted into degrees.**

The combination of this t_G with the estimated longitude gives us the L. A. T. reckoned to the East.

Thus we will have $t = 306° 45'$.

The sun's declination found from the Nautical Almanac, at the same time as the equation of time, is taken with approximation to minutes.

When L and d are of the same name both N or both S, subtract the less from the greater.

If they are of opposite names, as in our example, one N and the other S, add the two.

Thus we will have $L + d = 47° 19'$.

Entering the first tables with $L = 36° 52'$ and with $d = 10° 27'$, we will find respectively 4845 and 363.

Entering the succeeding tables with $t = 306° 45'$ in the column headed "Hour Angle," we will find 34858, which, added to the corresponding numbers $L + d$, will give 40066.

When t is less than 180°, we enter the tables from the top, and the star is to the westward of the meridian. When t is greater than 180°, we enter the tables from the bottom and the star is to the eastward of the meridian.

We now pick out the number 40066 in the same column ("Hour Angle") and opposite to that, in the column "Sum or Diff." we will find 31609. Adding this number 31609 to the number 3205 corresponding to 47° 19′ in the column "Sum or Diff." we will find 63814. This number corresponds to 21° 13′ in the column "Alt." (reading from the bottom).

The estimated altitude is, therefore 21° 13′.

TABLES OF AZIMUTH.

The azimuth can be rapidly and easily found by the following methods, already explained in our "Altitude and Azimuth Tables."

EXAMPLE: Given $t = 53° 15'$ E; $d = 10° 27'$ S and $L = 36° 52$ N. To find the azimuth (Z).

Entering the tables with $d = 10° 30'$ and with $t = 53°$, we will find approximately, $a = 52°$ and $b = 17°$. Combining b with L, we will have $C = 54°$ and entering again the tables with $a = 52°$ and $C = 54°$, we will find $Z = 57° 42'$.

Generally (when $Z < 70°$) it will not be necessary to combine b with L. It will suffice to go down the column h/d corresponding to $a = 52°$ until we find the value of $h = 21° 13'$ and to one side we will find $Z = 57° 42'$.

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* It is not necessary to repeat here but once that, by the immediate conversion of G. A. T. from "time" into "arc," you have the triple advantage of simplifying the finding of t, of abolishing the argument of time in the tables and the necessity of working with quantities expressed in time and in arc after this conversion.

b / B	a=10° 30′						a=11° 0′						a=11° 30′						c / C
	d / h		60′/Δ	t / Z		Δ/60′	d / h		60′/Δ	t / Z		Δ/60′	d / h		60′/Δ	t / Z		Δ/60′	
°	°	′		°	′		°	′		°	′		°	′		°	′		°
45	44	3	1.03	14	41	0.25	43	57	1.03	15	22	0.27	43	52	1.05	16	3	0.28	45
46	45	1	1.03		56	.27	44	55	1.03		38	.28	44	49	1.03		20	.28	44
47		59	1.03	15	12	.28	45	53	1.03		55	.28	45	47	1.05		37	.30	43
48	46	57	1.05		29	.30	46	51	1.05	16	12	.30	46	44	1.03		55	.32	42
49	47	54	1.03		47	.30	47	48	1.03		30	.33	47	42	1.05	17	14	.33	41
50	48	52	1.03	16	5	0.33	48	46	1.05		50	0.33	48	39	1.05		34	0.35	40
51	49	50	1.05		25	.33	49	43	1.05	17	10	.35	49	36	1.05		55	.37	39
52	50	47	1.03		45	.37	50	40	1.05		31	.38	50	33	1.05	18	17	.40	38
53	51	45	1.05	17	7	.38	51	37	1.05		54	.40	51	30	1.05		41	.42	37
54	52	42	1.05		30	.40	52	34	1.05	18	18	.42	52	27	1.07	19	6	.43	36
55	53	39	1.05		54	0.43	53	31	1.05		43	0.45	53	23	1.05		32	0.47	35
56	54	36	1.05	18	20	.47	54	28	1.05	19	10	.48	54	20	1.07	20	0	.48	34
57	55	33	1.05		48	.48	55	25	1.07		39	.50	55	16	1.07		29	.52	33
58	56	30	1.07	19	17	.50	56	21	1.07	20	9	.53	56	12	1.07	21	0	.53	32
59	57	26	1.05		47	.55	57	17	1.07		41	.57	57	8	1.07		33	.58	31
60	58	23	1.07	20	20	0.58	58	13	1.07	21	15	0.60	58	4	1.09	22	8	0.63	30
61	59	19	1.07		55	.63	59	9	1.07		51	.65		59	1.09		46	.67	29
62	60	15	1.09	21	33	.65	60	5	1.09	22	30	.68	59	54	1.09	23	26	.70	28
63	61	10	1.07	22	12	.72	61	0	1.09	23	11	.73	60	49	1.09	24	8	.77	27
64	62	6	1.09		55	.77		55	1.09		55	.78	61	44	1.11		54	.80	26
65	63	1	1.09	23	41	0.82	62	50	1.11	24	42	0.85	62	38	1.11	25	42	0.87	25
66		66	1.11	24	30	.88	63	44	1.11	25	33	.90	63	32	1.11	26	34	.93	24
67	64	50	1.11	25	23	.95	64	38	1.11	26	27	.98	64	26	1.13	27	30	1.00	23
78	65	44	1.11	26	20	1.02	65	32	1.13	27	26	1.05	65	19	1.15	28	30	1.08	22
69	66	38	1.13	27	21	1.10	66	25	1.15	28	29	1.13	66	11	1.15	29	35	1.17	21
70	67	31	1.15	28	27	1.20	67	17	1.15	29	37	1.22	67	3	1.18	30	45	1.25	20
71	68	23	1.15	29	39	1.30	68	9	1.18	30	50	1.33		54	1.18	32	0	1.37	19
72	69	15	1.18	30	57	1.42	69	0	1.20	32	10	1.45	68	45	1.22	33	22	1.47	18
73	70	6	1.20	32	22	1.55		50	1.20	33	37	1.58	69	34	1.22	34	50	1.60	17
74		56	1.20	33	55	1.68	70	40	1.25	35	12	1.72	70	23	1.25	36	26	1.73	16
75	71	46	1.25	35	36	1.85	71	28	1.25	36	55	1.87	71	11	1.30	38	10	1.90	15
76	72	34	1.28	37	27	2.03	72	16	1.30	38	47	2.05		57	1.30	40	4	2.07	14
77	73	21	1.33	39	29	2.23	73	2	1.33	40	50	2.23	72	43	1.40	42	8	2.25	13
78	74	6	1.36	41	43	2.45		47	1.40	43	4	2.47	73	26	1.43	44	23	2.45	12
79		50	1.43	44	10	2.70	74	30	1.46	45	32	2.68	74	8	1.50	46	50	2.68	11
80	75	32	1.50	46	52	2.97	75	11	1.58	48	13	2.95		48	1.58	49	31	2.93	10
81	76	12	1.58	49	50	3.27		49	1.62	51	10	3.23	75	26	1.71	52	27	3.18	9
82		50	1.76	53	6	3.57	76	26	1.82	54	24	3.52	76	1	1.82	55	38	3.45	8
83	77	24	1.94	56	40	3.92		59	2.00	57	55	3.82		34	2.07	59	5	3.73	7
84		55	2.14	60	35	4.23	77	29	2.22	61	44	4.32	77	3	2.40	62	49	4.00	6
85	78	23	2.61	64	49			56	2.73	65	51	4.42		28	2.73	66	40	4.27	5
86		46	3.16	69	23		78	18	3.33	70	16			50	3.53	71	5	4.48	4
87	79	5	3.75	74	14			36	4.62	74	56		78	7	4.62	75	34		3
88		19	7.50	79	20			49	7.50	79	49			20	8.57	80	16		2
89		27	20.0	84	37			57	20.00	84	52			27	20.00	85	6		1
90		30		90	0		79	0		90	0			30		90	0		0
t	a		60′/Δ	b		Δ/60′	a		60′/Δ	b		Δ/60′	a		60′/Δ	b		Δ/60′	
	d=10° 30′						d=11° 0′						d=11° 30′						

B	a=51° 0′						a=51° 30′						a=52° 0′						C
	h	d	60′/Δ	Z	t	Δ/60′	h	d	60′/Δ	Z	t	Δ/60′	h	d	60′/Δ	Z	t	Δ/60′	
°	° ′			° ′			° ′			° ′			° ′			° ′			°
0	0 0	1.58		51 0	0.00		0 0	1.62		51 30	0.00		0 0	1.62		52 0	0.00		90
1	38	1.58		0	.02		37	1.58		30	.02		37	1.62		0	.02		89
2	1 16	1.62		1	.02		1 15	1.62		31	.02		1 14	1.62		1	.02		88
3	53	1.58		2	.03		52	1.62		32	.03		51	1.62		2	.03		87
4	2 31	1.58		4	.03		2 29	1.58		34	.03		2 28	1.62		4	.03		86
5	3 9	1.58		6	0.05		3 7	1.62		36	0.05		3 5	1.67		6	0.05		85
6	47	1.62		9	.07		44	1.62		39	.05		41	1.62		9	.05		84
7	4 24	1.58		13	.07		4 21	1.62		42	.07		4 18	1.62		12	.07		83
8	5 2	1.62		17	.07		58	1.62		46	.08		55	1.62		16	.08		82
9	39	1.62		21	.08		5 35	1.62		51	.08		5 32	1.67		21	.08		81
10	6 16	1.58		26	0.08		6 12	1.62		56	0.08		6 8	1.62		26	0.08		80
11	54	1.62		31	.10		49	1.62		52 1	.10		45	1.67		31	.10		79
12	7 31	1.62		37	.12		7 26	1.62		7	.10		7 21	1.62		37	.10		78
13	8 8	1.62		44	.12		8 3	1.62		13	.12		58	1.67		43	.12		77
14	45	1.62		51	.12		40	1.67		20	.13		8 34	1.67		50	.13		76
15	9 22	1.62		58	0.13		9 16	1.62		28	0.13		9 10	1.67		58	0.13		75
16	59	1.62		52 6	.15		53	1.67		36	.15		46	1.67		53 6	.13		74
17	10 36	1.62		15	.15		10 29	1.67		45	.15		10 22	1.67		14	.15		73
18	11 13	1.67		24	.17		11 5	1.67		54	.15		58	1.67		23	.17		72
19	49	1.62		34	.17		41	1.67		53 3	.17		11 34	1.71		33	.17		71
20	12 26	1.67		44	0.18		12 17	1.67		13	0.18		12 9	1.67		43	0.18		70
21	13 2	1.67		55	.18		53	1.67		24	.18		45	1.71		54	.18		69
22	38	1.67		53 6	.20		13 29	1.67		35	.20		13 20	1.71		54 5	.20		68
23	14 14	1.67		18	.20		14 5	1.71		47	.22		55	1.71		17	.20		67
24	50	1.67		30	.22		40	1.71		54 0	.22		14 30	1.71		29	.22		66
25	15 26	1.71		43	0.23		15 15	1.71		13	0.22		15 5	1.71		42	0.22		65
26	16 1	1.71		57	.23		50	1.71		26	.23		40	1.76		55	.23		64
27	36	1.71		54 11	.25		16 25	1.71		40	.25		16 14	1.76		55 9	.25		63
28	17 11	1.71		26	.27		17 0	1.76		55	.25		48	1.76		24	.25		62
29	46	1.76		42	.27		34	1.76		55 10	.27		17 22	1.76		39	.27		61
30	18 20	1.71		58	0.27		18 8	1.76		26	0.28		56	1.82		55	0.27		60
31	55	1.76		55 14	.28		42	1.76		43	.28		18 29	1.82		56 11	.28		59
32	19 29	1.76		31	.30		19 16	1.82		56 0	.30		19 2	1.82		28	.30		58
33	20 3	1.76		49	.30		49	1.82		18	.30		35	1.82		46	.30		57
34	37	1.82		56 7	.32		20 22	1.82		36	.32		20 8	1.82		57 4	.32		56
35	21 10	1.82		26	0.33		55	1.82		55	0.32		41	1.88		23	0.32		55
36	43	1.88		46	.35		21 28	1.88		57 14	.33		21 13	1.88		42	.33		54
37	22 15	1.82		57 7	.35		22 0	1.88		34	.35		45	1.88		58 2	.35		53
38	48	1.88		28	.35		32	1.88		55	.37		22 17	1.94		23	.35		52
39	23 20	1.88		49	.37		23 4	1.94		58 17	.37		48	1.94		44	.37		51
40	52	1.94		58 11	0.38		35	1.94		39	0.38		23 19	1.94		59 6	0.38		50
41	24 23	1.94		34	.40		24 6	1.94		59 2	.38		50	2.00		29	.38		49
42	54	1.94		58	.40		37	2.00		25	.40		24 20	2.00		52	.38		48
43	25 25	2.00		59 22	.42		25 7	2.00		49	.40		50	2.07		60 15	.42		47
44	55	2.00		47	.42		37	2.00		60 13	.43		25 19	2.07		40	.42		46
45	26 25			60 12			26 7			39			48			61 5			45
t	a	60′/Δ		b	Δ/60′		a	60′/Δ		b	Δ/60′		a	60′/Δ		b	Δ/60′		
	d=51° 0′						d=51° 30′						d=52° 0′						

As we see, the first process is more simple than that of the A, B and C Tables, so much in vogue at present, for the combination of b and L is less complicated than the juggling with signs, and still more we have at our disposition a great abundance of arguments that give Z to half degrees without being necessary to interpolate.

The second method (that can *almost always* be employed) offers the same advantages as tables with three arguments (Davis, Labrosse, etc.), with the evident advantage of less bulk in our tables, that correspond to all declinations, all latitudes, all altitudes, and all hour angles, which is not the case with other tables.

A. B. HOFF,
Commander, U. S. Navy.

"Tin Soldiers." The Organized Militia and What It Really Is. By Walter Merriam Pratt, a first lieutenant in the 8th Massachusetts Infantry, with a foreword by Captain George E. Thorne, 24th Infantry, U. S. A. Published by Richard G. Badger, The Gorham Press, Boston. 182 pages and sixteen full page illustrations, price $1.62, postpaid.

This book is short, easy reading, the information it contains is intensely interesting, valuable and new to most people, and deserves to be read carefully by all doubters of as well as believers in the efficiency of the militia. The doubt is always due to ignorance and this book removes that. As the foreword explains, the militia has often been heavily and thoughtlessly maligned, but their importance is steadily increasing, and with this increase a better recognition of their work and usefulness is coming about.

The change in the militia from (1) merely citizens, then (2) trained bands, to (3) volunteers organized, but for state uses only, and finally (4) to the organized militia of to-day, armed, equipped, and uniformed as the regular army and subject to the call of the general government for service anywhere is sketched by the author.

The Dick Bill created an organized force of over 110,500 trained men, available in any locality, for national defense. To be more exact, there are at present 121,580 men and officers in the organized militia of the United States, and 15,493,125 in the reserve or unorganized militia.

The militia is being systematically and logically subdivided so as to make a completely balanced force when it is called upon to take the field, thus the proportions of infantry, cavalry, field artillery, engineers, signal troop, ambulance parties, and field hospitals to each other are rapidly becoming correct, this to the great advancement of general efficiency.

One who reads this book will leave it with a high idea of the earnestness and capability of its officers and men. The movement on foot in what is known as the Federal Pay Bill to compensate for their services seems to be very necessary and wise. The expenses of the annual encampments have sometimes had to be met by the assessment of individual dues.

The author describes the busy life of the officers with his studies and the many duties entailing upon him during drills, recruiting, instructions, etc., over and above that of the ordinary business man. The enlisted

man's outfit, as described, is complete and conforms absolutely to that of the regular army.

The organized militia is thoroughly discussed in its every phase, as are also its various duties.

Strike duty, in particular, is dealt with in detail. The experiences in the strike at Lawrence, Mass., January and February, 1912, are quoted. They show a capable organization, and that before the strike ended the militia had earned the respect of all, save professional agitators.

Their work at the various yearly maneuvers is written up in detail. Of especial interest are the pages dealing with the regular army encampment at San Antonio, in the summer of 1911, which was attended by many officers of the militia. The notes made by them show that their time was well spent and of much benefit to the militia. Their account is graphic of the discipline and drills, showing the efficiency of our regulars there under the command of General Carter.

Every young man is urged by the author to serve at least one enlistment in the regular army or the national guard, such service to be considered by him as a debt he owes to his country and flag. Such advice is too good, too good and valuable it is feared to ever be extensively followed.

The organized militia is no longer considered by the government as a kind of state police force. It is the secondary force of the United States Army for the National defence.

The tabulation of strength of our force with that of other countries in proportion to area and population to be protected is instructive.

RALPH EARLE.

La Marine Francaise en 1912. Le Programme Naval, by Captain A. Poidlouë, of the French Navy, formerly in command of the *Democratie*, *Montcalm* and *Chauteau-Renault*. Published by A. Challamee, 17 Rue Jacob, Paris, one volume, 122 pages. Price $ .50.

The discussion of the naval needs of France points out that she should command the Mediterranean, and her fleet should therefore be greater than that of Italy and Austro-Hungary combined.

The question of the command of the fleet in France is unfavorably compared with that of Germany and Great Britain, in that the command of the fleet in the former is assigned for short terms and to officers with no particular fitting or training for the same, and without high rank, while the two latter nations have an admiral, with a specially high rank, placed in supreme command for many years, and he is always one peculiarly fitted for this position both by training and personality.

Ships, dry docks, ports, powders and guns are compared with those of Germany and Great Britain.

The necessity of maneuvers on a large scale and of retaining units always in the fleet, using cruisers for the duties of peace in foreign lands is brought out forcibly.

The work is interesting to all students of naval progress.

RALPH EARLE.

"The Life of Lord Nelson." By Geoffrey Callender, B. A., of the Royal Naval College, Osborne, published by Longmans, Green & Co., 39 Paternoster Row, London. 148 pages with a naval glossary and many interesting and valuable illustrations.

The text of this book has been thoroughly enjoyed by those who have been fortunate enough to have read "Sea Kings of Britain," by the same author. It is history written instructively and entertainingly, and is thus peculiarly adapted for use in schools in the historical courses. In addition there is an introduction of 38 pages containing a plate of and complete description of vessels of that date, together with some excellent tactical notations. The illustrations are all new, interesting and valuable; that showing Nelson leading a boarding party to the *San Nicolas* at the battle of St. Vincent, and that showing a longitudinal section of the *Victory* are especially worthy of mention.

RALPH EARLE.

LIST OF PRIZE ESSAYS.

1879.

Naval Education. Prize Essay, 1879. By Lieut.-Com. A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut.-Com. C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880.

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881.

The Type of (I) Armored Vessel, (II) Cruiser best suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882.

Our Merchant Marine: The Causes of its Decline and the Means to be taken for its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. J. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut.-Com. F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883.

How may the Sphere of Usefulness of Naval Officers be extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884.

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885.

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886.

What Changes in Organization and Drill are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887.

The Naval Brigade: its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888.

Torpedoes. Prize Essay, 1888. By Lieut.-Com. W. W. Reisinger, U. S. N.

1891.

The Enlistment, Training and Organization of Crews for our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892.

Torpedo-boats: their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894.

The U.S.S. Vesuvius, with Special Reference to her Pneumatic Battery. Prize Essay, 1894. By Lieut.-Com. Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895.

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut.-Com. Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896.

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES. INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897.

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898.

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut.-Com. Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900.

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901.

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903.

Gunnery in Our Navy. The Causes of its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904.

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905.

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear-Admiral Stephen B. Luce, U. S. N.

1906.

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut.-Com. A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907.

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A few thoughts on our next step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut.-Comdr. Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908.

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENSE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut.-Commander Yates Stirling, U. S. N.

1909.

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910.

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotten, U. S. N.

1911.

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912.

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut.-Commander T. D. Parker, U. S. N.

SPECIAL NOTICE.

NAVAL INSTITUTE PRIZE ESSAY, 1913.

A prize of two hundred dollars, with a gold medal, and a life-membership in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession, subject to the following rules:

1. The award for the prize shall be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1913. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the Proceedings of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the Proceedings of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writer of the first of them in order of merit will receive seventy-five dollars and a life-membership in the Institute.

6. Any essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages of the Proceedings of the Institute.

8. All essays submitted must be either typewritten or copied in a clear and legible hand.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

RALPH EARLE,
Lieut.-Commander, U. S. N., Secretary and Treasurer.

MEDAL PRESENTED TO WINNER PRIZE ESSAY CONTEST, 1912

NOTICE.

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It now enters upon its thirty-ninth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute. by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII.

Sec. 1. The Institute shall consist of regular, life, honorary, and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

The Proceedings are published quarterly and anyone may subscribe for them. The annual subscription is $3.00; single copies, 75 cents. Annual dues for members and associate members, $2.00. Fee for life membership, $30.00.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.